A STATE-OF-PRACTICE SURVEY OF HEALTH AND ENVIRONMENTAL ASSESSMENT IN THE CANADIAN NORTH

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By

Jackie Bronson

"Impact assessment is no more than a process by which common-sense concerns about community futures are incorporated into decisions – public or private – that will affect the future."

(Meredith, 1995: 362)

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ABSTRACT

The need to strengthen the role of environmental and health considerations in decision-making processes is increasingly recognized by the Canadian government and industry-based organizations. Integrating human health into environmental assessments (EAs) at the earliest stage is critical for identifying and managing potentially adverse effects. The World Health Organization states "health depends on our ability to understand and manage the interaction between human activities and the physical and biological environment. We have the knowledge for this but have failed to act on it". In light of this shortfall, the primary objectives of this research are to evaluate the scope of health within EA, and to evaluate the state-of-practice with regard to the incorporation of human health impacts into the EA process within Canada's Northern natural resource sector. The adopted methodology combines both a mail-out questionnaire survey of practitioner and administrator experiences with EA across the North, as well as semi-structured interviews with health professionals. The results confirm the importance of human health integration in northern EA; however, in practice, 'human health' or 'human health impacts' are receiving inconsistent and superficial treatment with very little agreement as to the scope of health issues in EA. Project-based assessments are often limited to the investigation of the biophysical impacts and neglect to consider the social and cultural effects, and broader determinants of health. In cases where broader social health issues are addressed, attention seems to be limited to those impacts for which the proponents have direct control over, notably employment and business opportunities. Subsequently, the performance of northern EAs is often less than satisfactory, and improvements are required in the EA process to correct this. Barriers

to effective integration were found to include an incomplete understanding of the scope of health in EA; difficulties identifying causal links between project actions, environmental change and human health; the absence of standardized procedures; as well as economic and temporal barriers. Adapting the EA process to the specific needs of the North, including local culture and customs, and diverse knowledge systems is therefore necessary for EA practice to be successful. The research results contribute to a larger project to increase the understanding and effectiveness of health and EA systems, with specific attention on the Canadian North.

Keywords: Environmental Assessment, human health, northern development

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LIST OF ACRONYMS:

ADB: Asian Development Bank
AKTESP: Agreement, knowledge, technological, economic, social and political barriers
ARI: Aurora Research Institute
BMA: British Medical Association
BHPB: BHP Billiton Incorporated
CARC: Canadian Arctic Resources Committee
CEAA: Canadian Environmental Assessment Agency
CEARC: Canadian Environmental Assessment Research Council
CEU: Central European University
CHIA: Community Health Impact Assessment
CHIAT: Community Health Impact Assessment Tool
CNSC: Canadian Nuclear Safety Commission
CRI: Cogema Resources Inc.
DFO: Department of Fisheries and Oceans

EA: Environmental Assessment
EARP: Environmental Assessment Review Process
EHIA: Environmental Health Impact Analysis
EIA: Environmental Impact Assessment
EIS: Environmental Impact Statement
FNIHB: First Nations Inuit Health Branch
GNWT: Government of the Northwest Territories
HIA: Health Impact Assessment
HHIA: Human Health Impact Analysis
IBA: Impact Benefit Agreement
IEMA: Independent Environmental Monitoring Agency
INAC: Indian and Northern Affairs Canada
LIA: Labrador Inuit Association
MOU: Memorandum of Understanding
MVEIRB: Mackenzie Valley Environmental Impact Review Board
MVRMA: Mackenzie Valley Resource Management Act
NAS: National Academy of Science
NIRB: Nunavut Impact Review Board
NLCA: Nunavut Land Claims Agreement
NEB: National Energy Board
NWT: Northwest Territories
PPP: Policies, Plans and Programmes
PWGSC: Public Works and Government Services Canada
RA: Risk Assessment
SEA: Strategic Environmental Assessment
SES: Socio-economic Status
SIA: Social Impact Assessment
SPHERU: Saskatchewan Population Health and Evaluation Research Unit
SPSS: Statistical Package for the Social Sciences
VBNC: Voisey's Bay Nickel Company
VEC: Valued Ecosystem Components
YESAA: Yukon Environmental and Socio-economic Assessment Act
WCED: World Commission on Environment and Development
WGSG: Women and Geography Study Group
WEDC: Western Economic Diversification Canada
WHO: World Health Organization

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CHAPTER 1
INTRODUCTION

1.0 INTRODUCTION

Environmental assessment (EA) is broadly defined as a planning process to predict, assess and mitigate the potential impacts of project development on the biophysical environment (air, water, land, plants and animals) as well as on the human environment (culture, health, community sustainability, employment, financial benefits) of the people potentially affected (Noble, 2005). Addressing health impacts as part of project assessment is receiving increased attention from EA and health practitioners alike (e.g. Steinemann, 2000; Banken, 1999; Arquiaga *et al.*, 1994), and the need for and benefits of addressing health in EA have been recognized by many health authorities, including the World Health Organization (WHO, 1987) and Health Canada (1999). An international study of the effectiveness of EA by Sadler (1996), however, revealed that the consideration of health and other human impacts seems to be lacking or not given adequate treatment in project-level EA. Burdge (2002), and Joffe and Stutcliffe (1997) agree, suggesting that EA often fails to address the impacts of project development on human communities and culture. In the context of Canada's northern regions, a 1990 workshop sponsored by the Canadian Environmental Assessment Research Council (O'Neil and Solway, 1990) acceded that human health has not been given adequate consideration by processes that evaluate the effects of proposed developments on Canada's North. That being said, there has not since been a substantive evaluation of health integration in Canadian northern EA and there is little understanding as to the current state-of-EA practice.

1.1 Canadian EA Process

In Canada, EA was formally enacted in 1973 by the federal Environmental Assessment Review Process (EARP), later to be replaced in 1995 by the Canadian Environmental Assessment Act (herein referred to as the '*Act*') and revised in 2003.

EA is *not* a mechanism for preventing development actions, rather is a tool to ensure that decisions concerning development are made in the full knowledge of their environmental consequences (Noble, 2005). Responsibility for EA is shared between the federal government and each of the provinces and territories. The federal EA process is triggered when a proposed project will potentially affect an area of federal responsibility, involves federal support, or is likely to cause transboundary impacts. North of 60°, EA is under federal jurisdiction but in concert with various laws and regulations of the territorial governments (Mulvihill and Baker, 2001), including land claims agreements with Aboriginal and First Nations peoples.

The Canadian EARP, administered by the Federal Environmental Assessment Review Office (FEARO), changed in the mid 1990s after a court challenge stopped work on two western Canadian water development projects, namely the Rafferty-Alameda Dam in Saskatchewan (1990) and the Oldman River Dam in Alberta (1992) (Gibson, 2002; Meredith, 1995; CEAA, 1994). Both projects involved federal jurisdiction, however both were initiated without formal EA (Meredith, 1995). Effectively, the Supreme Court of Canada determined the Order in Council that drives the EA process to be the same as a legislative requirement. This decision caused federal authorities across Canada to take EA more seriously (Gibson, 2002). The two water development projects were catalysts for reform of the assessment process, leading way to the replacement of the EARP with the *Act* in 1995 and the establishment of the Canadian Environmental Assessment Agency to oversee its implementation.

While the EARP was broad and encompassed government 'actions' and 'decisions,' the current *Act* is restricted to 'projects' which are defined as either a physical work (such as any proposed construction, operation, modification, decommissioning, or abandonment) or physical activity (not related to the physical work and listed in the Inclusion List Regulations[1], for example low level military flying). The *Act* is triggered when a physical work or activity is on federal land, receives federal funds, is carried out by the federal government, or requires certain federal permits. The purposes of the *Act* are to:

[1] The Inclusion List Regulations is simply a list that describes those activities (projects) that must be subjected to an EA if a federal department or agency proposes, funds, or otherwise authorizes the project by issuing a permit or licence. See the Department of Justice Regulations, http://laws.justice.gc.ca/en/

a) ensure that projects are considered in a careful and precautionary manner before federal authorities take action in connection with them, in order to ensure that such projects do not cause significant adverse environmental effects; and,

b) encourage responsible authorities[2] to take actions that promote sustainable development and thereby achieve or maintain a healthy environment and a healthy economy.

Four different types of EA exist under the *Act*. These include screenings, comprehensive studies, panel reviews, and mediation. It is up to the responsible authority to ensure the screening is carried out. Screenings, the lowest level of assessment, are defined by the Canadian Environmental Assessment Agency (CEAA) (2003a) as:

> a systematic approach to documenting the environmental effects of a proposed project and determining the need to eliminate or minimize (mitigate) the adverse effects, to modify the project plan or to recommend further assessment through mediation or an assessment by a review panel.

Projects which require additional assessment must also identify alternative means of carrying out the project, and identify follow-up and monitoring programs (Boyd, 2003). Such assessments are identified on the 'Comprehensive Study List Regulations' and are generally complex, large-scale projects that have a greater potential for significant adverse environmental effects. Mediation assessment, on the other hand, is a voluntary process of negotiation in which an independent and impartial mediator appointed by the federal Minister of the Environment helps interested parties resolve their issues (CEAA, 2003b). Mediation can also be used in conjunction with a Panel Review to address specific issues that may arise in a project's EA. A Panel Review, the highest level of assessment, is comprised of a group of experts appointed by the Minister of the Environment to merge the EA process, selected on the basis of their knowledge and expertise (CEAA, 2003b). Panel Review EAs are a result of the conclusion that the environmental effects of a proposed project are uncertain, potentially significant, or where there is public concern (for example, the Cluff Lake Decommissioning Project).

[2] A responsible authority is defined as the "federal authority that either has proposed the project or has been asked to provide support or approval in the form of funding, land, or a permit, licence, or other approval specified by regulation" (CEAA, 1994).

1.2 Canadian Northern EA

The North is deeply embedded in the Canadian psyche with immense value placed on its landscape, biology, and human ecology (Evans *et al*., 2005). With significant advances in frontier resource exploitation throughout the 1960s and 1970s, it became increasingly important to reconsider the impacts development projects were having on the North. In 1970, the US Department of the Interior submitted a six-page environmental impact statement (EIS)[3] to accompany a proposal for construction of the 3860 kilometre long Trans Alaska Pipeline from Prudhoe Bay to Prince William Sound. The project would involve the transport of natural gas from Prudhoe Bay, Alaska, down through the Mackenzie Valley of Canada's Northwest Territories. In 1973, following the decision to build the pipeline, an Inuit tribal chief questioned: "now that we have dealt with the problems of permafrost and the caribou…, what about changes in the customs and ways of my people?" (Shantz, 2002). Such concerns were addressed by Chief Justice Thomas Berger who, in 1974, led an inquiry into Canada's Mackenzie Valley pipeline project, extending from the Beaufort Sea, Alaska to Alberta, Canada. The inquiry was the first of its kind in Canada to consider the potential impacts of development on the northern environment and the well-being of northern communities. Judge Berger concluded that human impacts on indigenous populations, including culture, society and health, were reasons for declining the permit to construct the pipeline (Gamble, 1978). The Berger Inquiry preceded the institution of formal EA (Mulvihill and Baker, 2001), but it would potentially change the prospect of northern development and the consideration of human impacts. It is not the intent of this section to explore in detail the history and evolution of EA in northern Canada, but rather to briefly set the context within which the evaluation of EA and health integration is situated.

Currently, EA in the three northern territories (Yukon Territory, Northwest Territories, and Nunavut) is conducted under four different legislative regimes, namely: the Canadian Environmental Assessment Act; the Yukon Environmental and Socio-

[3] An environmental impact statement (EIS) is the summary of the results of an EA. A draft EIS is made available for the public consultation process, after which a final version is prepared, and forms part of the subsequent decision making process (Burley *et al*., 1998).

economic Assessment Act (YESAA); the Mackenzie Valley Resource Management Act (MVRMA); and the Nunavut Land Claims Agreement (NLCA) (Figure 1.1). EA responsibility falls primarily under federal jurisdiction, except for the federal territorial agreement under the YESAA, and lands subject to regulation under numerous Aboriginal land claims and co-management boards (Noble, 2005). Sections 5 to 60 of the *Act*, for example, do not apply in the Yukon Territory except under special circumstances[4]. The MVRMA applies in the Mackenzie Valley[5] region of the Northwest Territories which includes the Gwich'in and Sahtu First Nations settlement areas. Similar to the Yukon Territory, the *Act* no longer applies in the Mackenzie Valley except under specific circumstances[6]. The NLCA, signed in 1993, established an EA review board, the Nunavut Impact Review Board (NIRB), which is the primary authority responsible for EA activities in Nunavut.

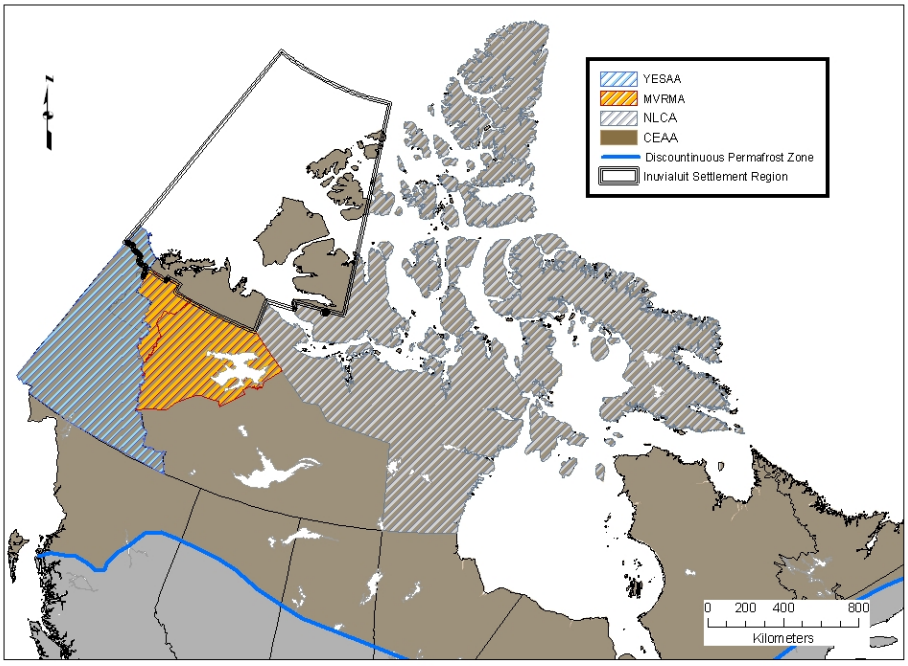

Figure 1.1. Legislative regimes in the Canadian North

[4] The *Act* applies in the Yukon Territory only if a project, as defined in the *Act*, requires an authorization from the National Energy Board (NEB) in order to be undertaken.
[5] For the purposes of the MVRMA, the Mackenzie Valley Region refers to all of the NWT with the exception of Wood Buffalo National Park and the Inuvialuit Settlement Region.
[6] The *Act* does not apply in the Mackenzie Valley Region in respect of proposals for developments other than: a) proposals referred to the Minister of the Environment pursuant to paragraph 130(1)(c), to the extent provided by the Act; or b) proposals that are the subject of agreements referred to in paragraph 141(2)(a), to the extent provided by such agreements.

Both the YESAA and the *Act*, which apply in the Inuvialuit Settlement Region[7] of the Northwest Territories, include health considerations as part of socio-economic impacts. The MVRMA and the NLCA both mention the importance of considering socio-economic impacts and also explicitly mention human health. Though the acts all include health considerations as part of socio-economic impacts, they are not specific about the scope of health. For example, one CEAA representative stated:

> It is important to understand that the *Act* (CEAA) sets out a framework for the assessment of the 'environmental effects' of projects. As this term includes changes on health and socio-economic conditions, in this sense the *Act* does not provide for the assessment of direct health effects of a project, but rather those health effects that may arise from a change in the environment brought about by a project. (CEAA per. Comm., 2004)

It is therefore left to the discretion of the individual practitioner to interpret and integrate human health impacts in EAs for northern development projects.

With the completion of the Berger Inquiry, the introduction of the YESAA, MVRMA, NLCA, and additional health guidelines by Health Canada (1999), one would expect to see human health playing an increasingly important role in northern EA; however, there has been no systematic evaluation of the state of health integration in northern EA practice. In light of this, the primary objectives of this research are to evaluate the scope of health within environmental assessment (EA), and to evaluate the state-of-practice with regard to the incorporation of human health impacts into the EA process within Canada's northern natural resource sector.

1.3 Assessing Health Impacts in EA

1.3.1 Conceptual Perspective

Human health is defined by the World Health Organization (WHO) (1947: 29) as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." As illustrated by Figure 1.2, human health is inextricably linked to the health of the environment, economy and surrounding communities. The

[7] The Inuvialuit Settlement Region, signed in 1984 between the Canadian government and the Inuit of the Western Arctic, was established to preserve Inuvialuit culture, identity, values and regional environmental productivity (Noble, 2005).

quality of the environment combined with the strength of the economy and support of the surrounding communities are therefore key concerns for assessing human health. Despite its centrality, the concept of health within the physical environment is usually viewed from a scientific perspective, such as identifying the presence or absence of disease. 'Health' in EA, arguably, goes beyond this.

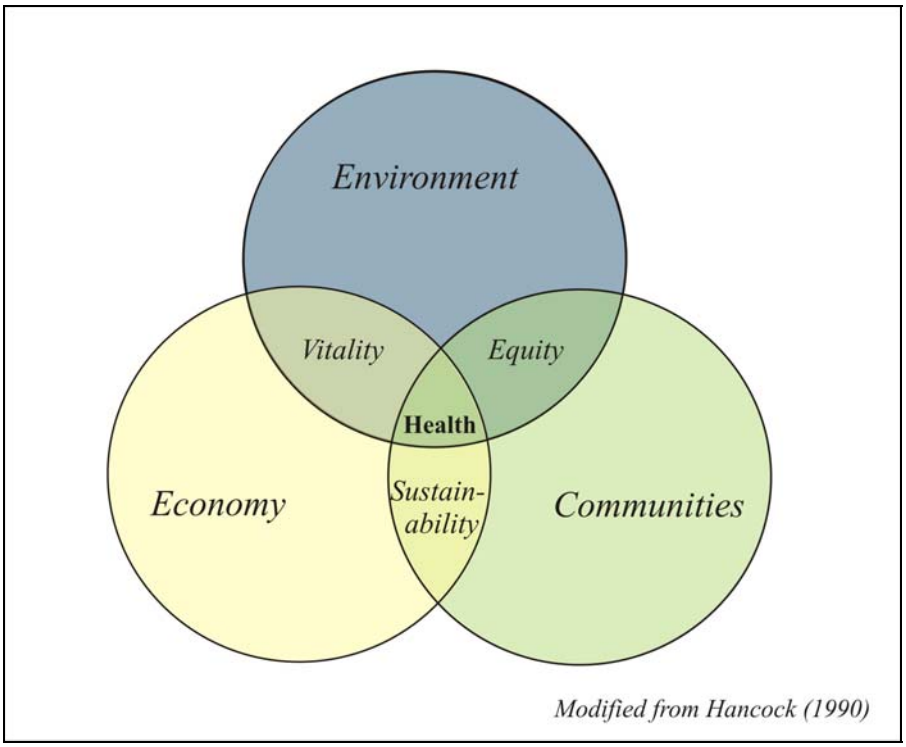

Figure 1.2 Role of human health
Source: Sadler and Jacobs (1990)

Environmental Assessment[8] has traditionally been divided into environmental impact assessment (EIA) and social impact assessment (SIA) (Burdge, 2002, 1999; Mitchell, 2002), reflecting the academic bias between the natural (physical) sciences and the social sciences (Barrow, 1997; Davies and Sadler, 1997). EIA has been defined, in the academic literature, as a systematic process that proactively examines the consequences of development actions (Arts *et al.*, 2001; Morrison-Saunders and Bailey, 1999). SIA on the other hand, is defined as the systematic analysis, in advance, of the likely impacts a proposed action will have on the day-to-day life of individuals and

[8] In the context of this research, EA includes within it, environmental impact assessment (EIA) as well as social impact assessment (SIA) practices.

communities (Burdge, 1999). In accordance with the *Act*, EIAs must also account for any impacts on the social and economic environments of the people to be effected by the proposed development, of which health is one component (CEAA, 2003b). Compliance with this requirement, therefore, has the potential to operationalize health integration into EIA at its initial stages. However, the division between EIA and SIA is also reflected in the assessment of health effects. Assessing the physical health effects (epidemiology[9]) of project development is often predominant over assessing spiritual, social or psychological well-being, especially with regard to northern development (O'Neil and Solway, 1990).

In 1994 Health Canada, through the Advisory Committee on Population Health, released its *Strategies for Population Health: Investing in the Health of Canadians,* introducing the nine health determinants associated with EA. Figure 1.3 outlines these health determinants, which are consistent with the WHO's (1987) notion that health is much more than the absence of disease and includes social and psychological well-being, as well as the capacity to respond to the changing circumstances and conditions of life (Davies and Sadler, 1997). However, these determinants were derived by Health Canada based on research in the most populated areas of Canada and do not take into consideration the uniqueness of northern communities (FNIHB, 2001). O'Neil and Solway (1990) report that factors such as 'sustaining Aboriginal cultural identity' and the 'link to the environment through the teachings of traditional values' should be important aspects of assessing the health effects of northern development. This includes maintaining the integrity of such activities as hunting on the 'land' and obtaining traditional native foods, as well as psychological, social, cultural and spiritual values. One question that emerges from Figure 1.3 is whether this framework sufficiently covers the scope of health within northern environments. This research will explore the proposed framework and reconsider its scope.

[9] Epidemiology is defined by the World Health Organization (WHO) as the study of diseases or other health-related events in communities (WHO, 1992: 51).

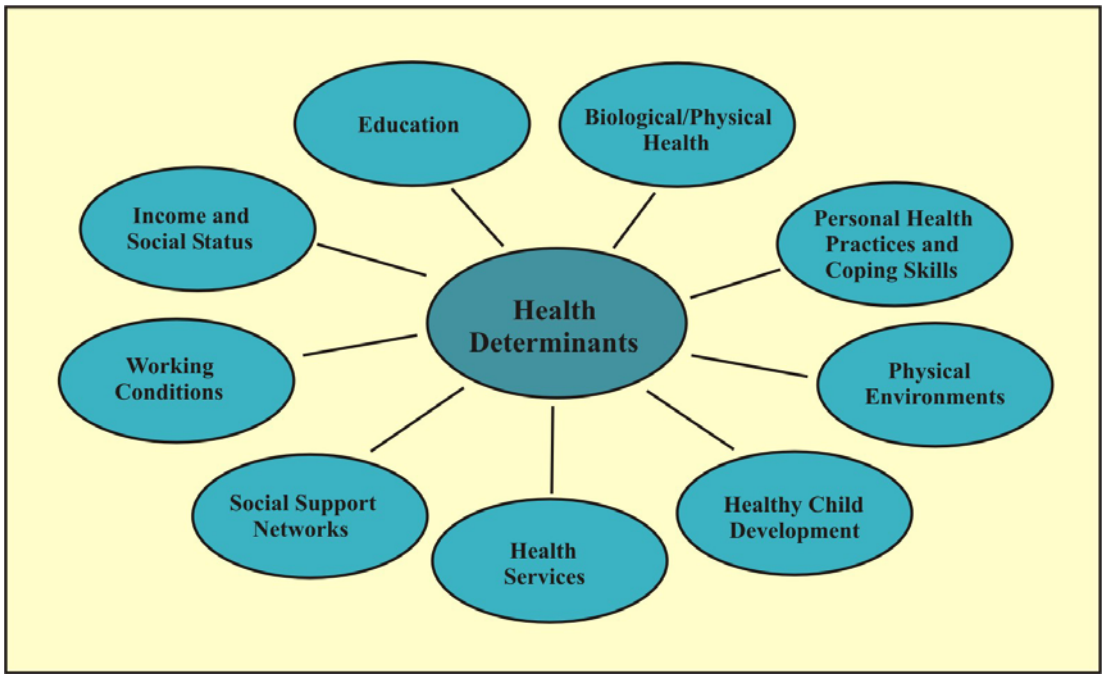

Figure 1.3. Determinants of health.
Source: Modified from Health Canada, 1999.

1.3.2 Applied Perspective

A 1990 workshop by the Canadian Environmental Assessment Research Council (CEARC), held specifically to discuss how well human health is incorporated in EA within northern Canada, acceded that human health is not adequately considered by processes that evaluate the effects of proposed development in the North (O'Neil and Solway, 1990), and when health effects are considered within EA they are generally limited to the investigation of effects on the non-human, natural environment (Davies and Sadler, 1997). The Canadian Federal/ Provincial/Territorial Committee on Environmental and Occupational Health (1996) later report that the incorporation of health in EA has increased in recent years due to the adoption of the requirements that all provinces and the federal government include health within all EAs. Thus, while there is every reason to expect continual process development in EA, research is needed to increase the understanding and effectiveness of incorporating health into EA systems within Canada's North.

Under the current *Act*, an 'environmental effect' is defined as "any change that the project may cause in the environment, including any effect of any such change on health…" (CEAA, 2003a, c.37 s2(1)). Legislative, regulatory or procedural

requirements can play an important role in broadening the scope of EA to include health (Davies and Sadler, 1997). The EA process therefore provides a logical medium in which to consider human health impacts (Laws and Sagar, 1994). However, recent research (see, for example: McCarthy *et al.*, 2002; Birley, 2002; Steinemann, 2000; Canadian Federal/Provincial/Territorial Committee on Environmental and Occupational Health, 1999) suggests that health impacts are not adequately addressed in current EA practice and the concept of 'health' is not clearly defined within Canadian legislation.

This is particularly the case in northern Canada where EA itself has been described as less than desirable (Bone, 2003; Kwiatkowski and Ooi, 2003; Mulvihill and Baker, 2001), and there has been very little attention given to integrating human health in EA practice. A few studies have addressed the issue, specifically the amount of attention given to health impacts in EA impact predictions (Birley, 2002; Steinemann, 2000; BMA, 1998; Canter, 1996). These studies however, do not address the real state of EA practice from scoping and impact prediction to follow-up and monitoring. In addition, there has been a significant advance in frontier resource exploitation in recent years within northern Canada (Bone, 2003). This drive to open the North for economic development increases the need to effectively integrate health considerations, specific to those living in the North, into the EA process. By examining practitioner and administrator experiences in northern Canada, this research attempts to make some contribution in this regard.

1.4 Research Objectives

The need to strengthen the role of environmental and health considerations in decision-making processes is increasingly recognized by the Canadian government and industry-based organizations. The World Health Organization (1992: xiv) states "health depends on our ability to understand and manage the interaction between human activities and the physical and biological environment. We have the knowledge for this but have failed to act on it". In light of this shortfall, this research asks two questions:

i) What is the scope of health in northern EA?; and,

ii) What is the current state-of-practice of health integration in northern EA?

These questions are explored based on the following research objectives, to:

1) identify the provisions for health impact assessment under northern environmental assessment systems;

2) identify 'health determinants' for consideration in project assessment as outlined by Health Canada and related health literature;

3) evaluate the state-of practice of health in EA based on a survey of EA, health practitioners and administrators experiences with EA across northern Canada; and,

4) determine, based on the state-of-practice results, if additional determinants need to be considered when assessing the health impacts of projects in northern environments.

This research attempts to gain an understanding of what is being done in terms of health assessment from the EA perspective, including the challenges and usefulness of Health Canada's framework with regard to integrating health in EA for northern development. It does not attempt to evaluate any particular northern development project *per se*.

The scope of this research is therefore restricted to recent practices in the mining and energy sector, and development projects within the North that fall, at least in part, under the federal EA system. In other words, this research focuses on the EA 'process' itself, rather than specific projects or EA autonomy and the actual effects of projects on northern communities. While recognized as important, specific health effects of northern development projects on northern communities are outside the immediate scope of this research. The narrower focus enables the researcher to meet time restrictions while maintaining an adequate number of EA cases appropriate to the North. This research is set within a broader research project (Figure 1.4), to increase the understanding and effectiveness of health and EA systems across Canada, led by Dr. Bram Noble at the University of Saskatchewan. The broader research project asks:

- What are the provisions for health impact assessment under Canadian environmental assessment systems?;
- What is the current state of practice of health impact assessment in Canada?;
- What are the key barriers to practice and how can these be addressed?; and,
- What are the principles and characteristics of 'best'-practice health impact assessment for environmental assessment?

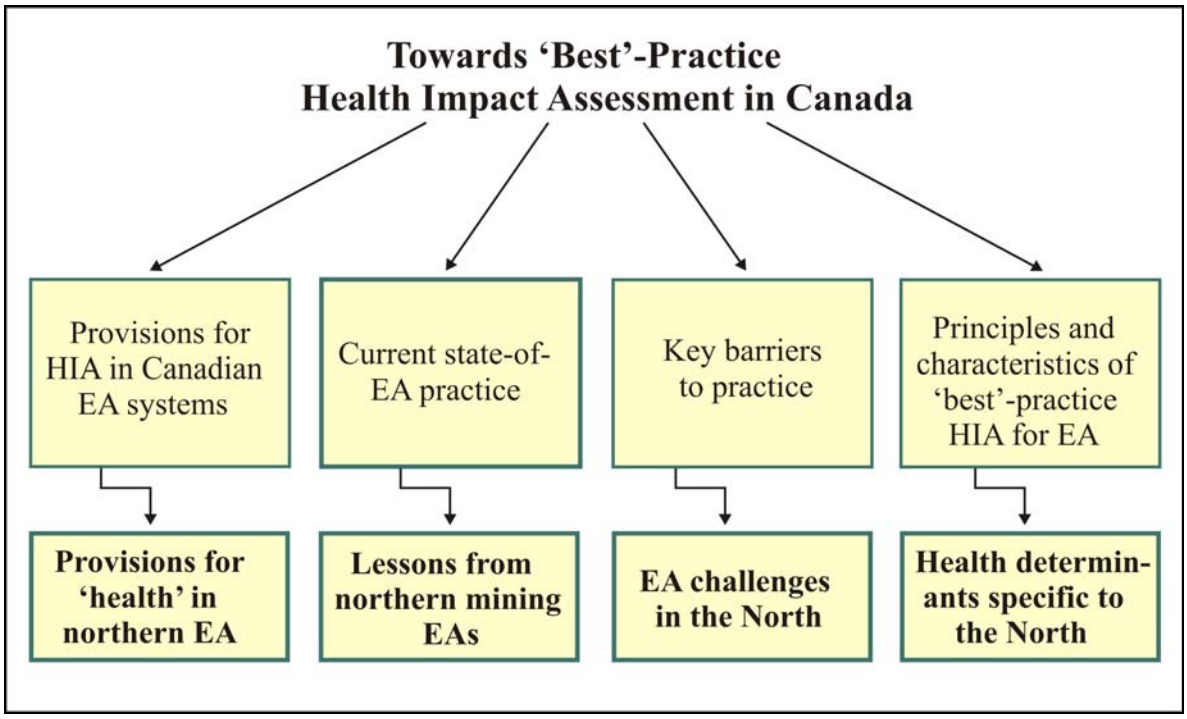

Figure 1.4 Broader Research Project

1.5 Study Area

For the purposes of this research, 'North' is defined as the area north of the southern limit of the discontinuous permafrost zone (Figure 1.5). The study area was chosen based on three criteria. First, this definition allows the inclusion of development projects which are located in the northern parts of the provinces (for example, uranium mines in northern Saskatchewan). Second, it is more appropriate to define the area based on physical environmental attributes rather than using spatial political boundaries (for example, north of 60˚ latitude), as there is no single EA system for northern Canada. Finally, most of Canada's population is inhabited within 30 kilometres of the Canadian/United States border. Subsequently, most of the research takes place in this region. The North, home to unique environmental, economic, socio-political, and cultural realities, differs substantially from the rest of Canada (Mulvihill, 1990; Kwiatkowski and Ooi, 2003) and has not previously been examined in the context of health integration in EA for northern development projects.

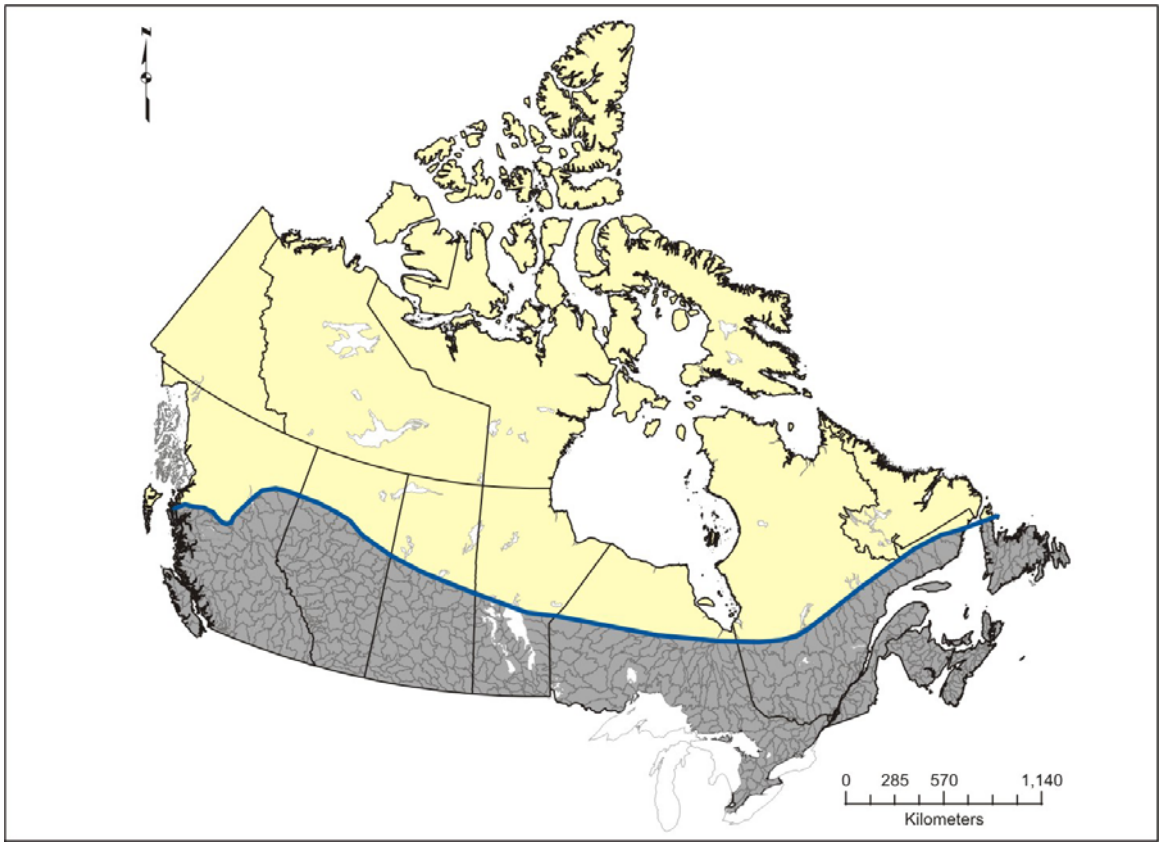

Figure 1.5 The Canadian North, Defined as the area north of the southern limit of the Discontinuous Permafrost Zone

1.6 Thesis Structure

The thesis consists of five chapters. The second chapter examines the function of EA and the scope of health. Chapter 3 describes the mixed methodology used to realize the research objectives, and Chapter 4 presents the research results and discussion. Chapter 5 provides a broader discussion on the significance of the research findings and provides direction for moving forward in northern EA and health integration.

CHAPTER 2
LITERATURE REVIEW

2.0 INTRODUCTION

A proliferation of literature exists on the health of Canadians and the determinants of health (see Wilson and Rosenberg, 2002 for an overview); however, few studies have examined the scope of health, and how this coincides with EA practices. Human health is in part dependent on the health of the physical environment and, therefore, the manner in which we extract and use natural resources can affect the health and sustainability of both our natural and human environments. More effective use of our resources, including environmental, social, economic and political, can improve human health (Young, 1995). The purpose of this chapter is to explore the role and scope of health within a northern EA context. Following an overview of the EA process, the literature review concentrates on EA and related health research predominantly completed in the last decade, as the focus of this thesis is on the current state-of-EA practice.

2.1 Overview of the Environmental Assessment Process

The common procedural elements of EA include:

- screening[10] the project to determine whether or not an EA is required;
- scoping or identifying the issues to be considered;
- assessing the potential effects;
- consulting the public about their concerns;
- determining the significance or importance of the effects; and,
- implementing mitigation measures and follow-up activities.

The purpose of screening is to identify the source or origins of impacts (Munier, 2004), whether the project is likely to have important effects and whether it is subject to an

[10] Introduced in Chapter 1, a screening assessment is one type of EA under the *Act*. In the context of the generic EA process, screening refers to identifying which projects are likely to have important effects on human health and the environment, whether those projects require an EA, and what type of EA is necessary.

EA. This stage provides the basic information – the 'who', 'what', 'when' and 'where' – regarding the project. It is at this stage that the project's potential impacts on human health should first be considered and health professionals involved (Health Canada, 2003). According to Davies and Sadler (1997), it is important that health be included during this initial stage, because otherwise, health is unlikely to be addressed in subsequent stages of EA. Ewan *et al*. (1993: 47) agree, stating:

> Health input (in screening) is important, although it is frequently omitted at this stage unless policies and legislation require mandatory consultation with health authorities for designated development.

A description of the project and the environmental setting is also produced during this stage. Ideally, the project description will be prepared by the proponent in conjunction with a health professional, or someone with a thorough understanding of environmental and health issues within the context of the proposed project and its local environment (Health Canada, 1999).

The second phase of the EA process, scoping, serves to identify the key issues to be considered in an EA (Health Canada, 1999), and thus should include any health issues to be assessed (Davies and Sadler, 1997). According to Health Canada (1999), the scope of an EA is analogous to an EA workplan and lays the foundation for an effective assessment by identifying significant issues and the potential environmental effects that the project might have on the biophysical and social environment. Depending on the size and nature of the project, the types of health effects identified during this stage will vary. In the Canadian Handbook on Health Impact Assessment, for example, Health Canada outlines four main objectives of the scoping process, namely to:

- determine the factors to be considered, alternatives to the project and potential effects of the project to be considered;
- prioritize the issues to be addressed in the EA;
- set appropriate boundaries for the EA study; and,
- determine the appropriate level of effort for the EA.

Approaches to EA scoping have varied considerably in northern Canada, reflecting both ambitious and restrictive models. Mulvihill and Baker (2001) contend that ambitious scoping practices, ones designed explicitly with intercultural EA challenges in mind, can improve EA processes and outcomes. Prioritizing issues in scoping must therefore be done by the proponent in conjunction with the public and experts. Through this process, the main environmental and health concerns raised by the project are brought to light, and enable the proponent to focus time and resources more effectively.

Determining the appropriate scale for an EA is also very important during the scoping stage. João (2002), for example, demonstrates that changes in scale can affect the results of EA. Therefore, the appropriate spatial and temporal boundaries should be consistent with the magnitude and severity of the potential effects caused by the project. Spatial boundaries are set on the basis of the geographical limits of the impacts whereas temporal boundaries deal with the timing and the life span of the impacts arising from the project (Munier, 2004). Jurisdictional boundaries are also important and refer to the legal requirements that the project must adhere to (Canter, 1986). All three types of scale will help determine the potential impacts a project my have, including those impacts on health. Spatial and temporal health factors to be considered during the scoping phase, as outlined by Health Canada (1999), include hazardous agents, environmental, exposure conditions, effects on physical health, effects on health care services and effects on social well-being.

Following scoping, the next step in formal EA is to use the baseline data collected to determine project impacts and significance. This includes assessment of the potential health, environmental and social effects of the project, characterizing these impacts and communicating the significance of the effects to decision-makers. Identified during the scoping process, the baseline health status of the affected population must be determined. This is particularly important for sensitive sub-groups such as workers, Aboriginal people, children, pregnant women and the elderly (Health Canada, 1999). This step is necessary to enable proponents to weigh the potential positive and negative health effects and risks of a project.

In practice, however, as suggested by Davies and Sadler (1997), EAs rarely include baseline data that are relevant to human health. This may be due in part to the absence of such data in remote areas, such as many parts of the North, or that such data are simply not made available to proponents by health authorities. A related concern is the use of broad health guidelines and objectives for impact evaluation. For example, though a straightforward means of determining significance health-based guidelines and objectives are typically limited to protecting against acute health effects, such as cancer (Steinemann, 2000). Thus, Davies and Sadler (1997) contend that compliance with health-based guidelines does not necessarily guarantee protection from all types of adverse health effects often associated with project developments. It is therefore necessary to develop health-based guidelines that are environmentally and socio-economically relevant to the geographic region, such as the Canadian North.

The fourth stage of EA focuses on mitigation and follow-up. Mitigation, as defined by the *Act* (CEAA, 2003a, c.37 s2(1)), involves those activities or strategies which are designed to avoid or alleviate predicted negative project impacts. The World Health Organization (1985) identifies three categories of mitigation measures specifically for health effects, including:

- mitigation through control of sources (for example, pollution standards);
- mitigation through control of exposure (for example, planning requirements); and,
- mitigation through health service development (for example, health education).

Most importantly, Davies and Sadler (1997) argue that mitigation measures for effects on human health should be designed to suit local circumstances, including the environmental, social, cultural, political and economic conditions, and be acceptable to the potentially affected population(s). What seems to be missing from current practices is the management of health impacts to create or enhance overall positive health outcomes. This issue is returned to later in the thesis.

Follow-up, on the other hand, is often used as an umbrella term to encompass monitoring, auditing, and post-decision analysis (Noble, 2005). Its principle aims are to improve project implementation with respect to environmental protection outcomes and

to provide feedback on EA processes (Morrison-Saunders *et al.*, 2003). Follow-up is necessary to verify that there are no unanticipated effects on health and well-being. This stage is perhaps the most crucial of the EA process to increase the understanding of the actual physical and social impacts of projects (Health Canada, 1999).

The final step in an EA is the decision as to whether or not the project should be allowed to proceed, and if so, what conditions should be attached to the approval (Health Canada, 1999). Recommendations can include specific mitigative measures, requirements for certain monitoring activities or modifications to operating procedures. Both the potential adverse environmental and health effects of the project and the anticipated beneficial effects are to be taken into consideration by project decision-makers during this final stage of the EA process.

Public participation is an integral part of the EA system (Petts, 1999), integrated throughout to ensure a comprehensive and transparent process (Munier, 2004). The consultation process is an important outlet for the public to voice its concerns about a project's adverse effects on health, well-being and the quality of life (Sinclair and Diduck, 2001; Archibald and Crnkovich, 1999). Including the public from the outset enables different perspectives and views to come forward, and will hopefully ensure that important aspects of health and well-being are not overlooked. Furthermore, the public may have valuable knowledge and insights (traditional knowledge) into the ecosystems, social and cultural environments that will be potentially affected by a project (Health Canada, 1999).

2.2 The Nature of Health in EA

2.2.1 Background

International research on health and EA includes work by Gilad (1984), Giroult (1984), and the World Health Organization (1990). However the focus of health research in EA was, and, arguably remains, primarily on developing guidelines to measure and predict changes in human health using scientifically based methods (epidemiology and toxicology), and neglects the social and cultural elements of human health (Birley, 2002; Davies, 1992; Martin, 1986). Acquiring guidance and direction

from international sources[11], health inclusion in Canadian environmental policy began with a national workshop sponsored by CEARC entitled *Health Aspects of Environmental Impact Assessment* held in Ottawa in 1987 (Canadian Public Health Association, 1987). The workshop's objectives were to:

- incorporate public health considerations into environmental assessment in Canada;
- determine roles and responsibilities for achieving greater involvement of health professionals in environmental assessment activities; and,
- identify mechanisms for developing stronger operational and research links between the environmental assessment community and relevant health professionals.

The workshop concluded that if health is to be further integrated into EA, there is a need to increase the number of trained environmental health professionals and to improve the quantity and quality of health data (Canadian Public Health Association, 1987). As a result, a series of regional multi-disciplinary workshops were organized to examine the scientific needs, the procedural, institutional and jurisdictional mechanisms, and the socio-political conditions that encourage the inclusion of health in EA (Davies, 1992). Health inclusion was further explored later the same year (1987) when the CEARC commissioned a survey on the nature and extent of the inclusion of health in EA in Canada, discussed later in this chapter. Over time, particularly in Europe (Hansell and Aylin, 2003), various approaches to integrating health into EA have developed and are slowly changing the way EAs are conducted in Canada.

Several complimentary methods or procedures, for example, exist to examine the potential impacts on human health, most notably, health impact assessment (HIA) or human health impact analysis (HHIA), social impact assessment (SIA) (discussed in Chapter 1), risk assessment, and strategic environmental assessment (SEA). HIA has been described as a combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population (WHO, 1999). Its use and development are growing substantially in Europe (Hansell and Aylin, 2003),

[11] See, for example, Put, *et al*. (2001); the Commission of the European Communities (2000).

and is a benchmark for the rest of the world. HIA, unlike SIA, depends largely on quantitative data, though difficult to obtain in some regions. Similarly HHIA, developed by Lowrance (1976), can be broken down into five steps, namely to:

> 1) identify the conditions of exposure (i.e. conduct an exposure assessment stipulating who is exposed to what, when, in what way, etc.);
>
> 2) identify any adverse effects[12] of exposure to the agents identified in (1);
>
> 3) determine a quantitative relationship (i.e. a dose-response relationship) between levels of exposure and the presence of severity of each adverse effect identified in (2);
>
> 4) estimate the risk by applying the dose-response relationship identified in (3) to each adverse effect in (2), given the conditions of exposure (1); and,
>
> 5) make policy and management decisions, having calculated the risk and taking into account societal values about the acceptability of the risk and the cost of various management options.

The National Academy of Science (NAS) revised this framework in 1983 to include *uncertainty analysis* in the first four categories and separating step five, renaming it *risk management* (NAS, 1983 as cited in Ozonoff, 1994). Risk assessment, as characterized by the five steps of Lowrance's framework, is defined by the National Research Council and Committee on the Institutional Means for Assessment of Risks to Public Health (1983: 77) as:

> The use of the factual base to define the health effects of exposure of individuals or populations to hazardous materials and situations.

Though initially used for evaluating hazardous processes, risk assessment has become an increasingly useful tool to assess health impacts in EA practice (Wlodarczyk and Tennyson, 2003; Mindell *et al*., 2003; Ozonoff, 1994). However, inconsistent definitions of 'risk' determine which perceived risks are included within the EIS, and, in turn, have an impact on the nature of the social, economic and cultural effects assessed (Wlodarczyk and Tennyson, 2003).

[12] Environmental effects refer to changes in the condition of a particular environmental or socioeconomic parameter, and are usually measurable. Environmental impacts are estimates or judgments of the value that society places on certain environmental effects (Noble, 2005). Within the context of this research, effects and impacts are used interchangeably.

Wlodarczyk and Tennyson (2003) contend that it does not matter whether the risk is above or below a regulatory standard, rather it is largely dependant on people's attitudes towards the risk to determine its significance. A Finnish study on perceived health and perceived health impacts for example, suggests that the term 'human impacts' would expand the concept of environmental impacts and risk and redirect attention to humans and human impacts along with the natural and environmental impacts in a comprehensive fashion (Savolainen-Mäntyjärvi and Kauppinen, 2000). Perhaps a more inclusive approach to health assessment and integration is SEA, which involves reviewing policy, plan and program (PPP) proposals to incorporate environmental considerations into the development of public policies (CEAA, 1999), and is now seen as a supporting tool for decision making towards achieving sustainable development (Noble, 2002).

Quantifying impacts rather than relying solely on qualitative data is important in EA practice, as decision makers often place more weight on an impact assessment which contains quantified analysis than one which does not (McCarthy *et al*., 2002). One method of quantifying health impacts is the mathematical model proposed by McCarthy *et al*. (2002), illustrated in Figure 2.1. The model, though proposed for urban developments, enables practitioners to utilize the expected effects of exposure (relative risks), of different levels of exposure, and environmental changes to calculate estimates of the health status of populations potentially affected by development.

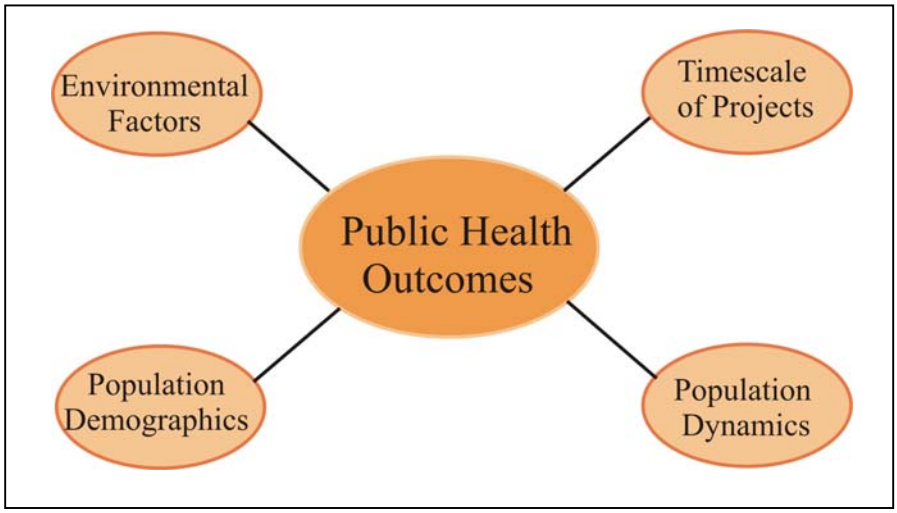

Figure 2.1 Key elements of the Mathematical Model
Source: McCarthy *et al*., (2002)

Despite the method, or combination of methods chosen to assess health impacts, there are a number of costs and benefits to integrating them into EA practice. As illustrated in Table 2.1 the costs include increased complexity and duplication if all the different types of assessments are added to each other (i.e. EIA, SIA, RA and HIA). This is, however, often countered by improvements in the quality of EA decisions. As EA is a "planning tool that is … an integral component of sound decision-making" (Supreme Court of Canada, 1992), integration of different methods upholds the notion that EA supports sustainable development, and will further assist practitioners to predict and mitigate potentially adverse impacts associated with development projects on human health. Despite this importance, a diminutive amount of research has been done that explores the nature and scope of health in Canadian EA practice. This research attempts to utilize and build upon previous work (e.g. Kwiatkowski and Ooi, 2003; Health Canada, 2003; 1999; Canter, 1995; Sadler, 1995; Arquiaga *et al*., 1994; Davies, 1992; O'Neil and Solway, 1990; Martin, 1986) to assess the current state-of-health integration in EA in the Canadian North.

Table 2.1 Benefits and costs of integrating SIA, HIA, and RA into EIA

BENEFITS	***COSTS***
• Can address the social, economic, cultural, health and risk effects more effectively.	• More difficult and complex (more expertise involved).
• A strong link already exists between SIA and EIA with regard to public consultation and participation.	• If the integration means more assessment and more management, higher costs are incurred by the developer.
• Risk assessments can be incorporated into EIA through referencing.	• Incorporating a full risk assessment into an EIA may be excessive and inappropriate.
• Increased accuracy of decision making.	• Duplication can occur.

Source: Modified from Bellinger *et al*., 2000

2.2.2 Scope of Health in Canadian EA

The incorporation of human health in EA practice is closely related to sustainable resource use and sustainable development. For example, section 4(b)(1) of the *Act* (CEAA, 2003a) identifies sustainable development as a fundamental objective

of the federal environmental assessment process. The World Commission on Environment and Sustainable Development, in their report entitled "Our Common Future", defines sustainable development to include human health and well-being (WCED, 1987). Furthermore, Principle 1 of The Rio Declaration, adopted in 1992 (United Nations, 1993, cited in Corvalán *et al*. 1999: 656), highlights the importance of human health by stating:

> Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Thus, not only is EA a tool for predicting environmental consequences, it is also a process that should contribute to sustainable development through the incorporation and management of human health impacts due to project developments (Corvalán *et al*., 1999).

The Canadian government has a responsibility to protect the environment, and there is an increasing interest in incorporating non-traditional aspects of health within the scope of EA, such as the social, community, and psychological dimensions of health and well-being (Davies and Sadler, 1997; CEARC, 1991). This interest is reflected by Canada's endorsement of the WHO's broad definition of health in environmental policy. Under the current *Act* for example, health is included as one of the important dimensions of an 'environmental effect' (CEAA, 2003a, c.37 s2(1)), and Canada's provinces and territories have also included 'health' in EA under different legislative acts and requirements (Table 2.2). However, even with this broad definition of 'health' as recognized in EA legislation, the scope of health and the actual health effects that should be considered in EA are rarely defined and vary considerably in practice (Davies and Sadler, 1997). Previous research (e.g. Mulvihill and Baker, 2001; O'Neil and Solway, 1990; Simon, 1988) suggests that there is very little guidance available to practitioners concerning the appropriate scope and integration of health into northern EA. Davies (1992) suggests that ultimately, health is self-defined by individuals, communities and societies and therefore needs to be assessed within the context of the cultural and social environments in which the development is taking place.

The 1990s was characterized by an inception of health-related guidelines and handbooks on best-practice health assessment for EA practitioners[13]. One such handbook is the Canadian Handbook on Health Impact Assessment (Health Canada, 1999), which outlines several reasons to integrate health into EA, including:

1) addressing public concerns;
2) minimizing the need for separate health and environmental impact assessments;
3) demonstrating cost effectiveness;
4) minimizing the adverse and maximizing the beneficial effects on health; and,
5) supporting the concept of sustainable development.

Table 2.2. Requirements for including health in EA in Canada

Juristdiction	EA legislation	Date first implemented
British Columbia	Environmental Assessment Act	1995
Alberta	Alberta Environmental Protection and Enhancement Act	1992
	Alberta Public Health Act	2000
Saskatchewan	Environmental Assessment Act	1980
Manitoba	Environment Act	1987
Ontario	Environmental Assessment Act	1975
Quebec	Environmental Quality Act	1978
New Brunswick	Clean Environment Act	1973
Nova Scotia	Nova Scotia Environmental Assessment Act	1994
Newfoundland	Environmental Assessment Act	2002
Prince Edward Island	PEI Environmental Protection Act	1988
Yukon Government	Yukon Environmental and Socio-economic Assessment Act	2002
	Canadian Environmental Assessment Act	1992
Northwest Territories	Mackenzie Valley Resource Management Act	1998
	Canadian Environmental Assessment Act	1992
Nunavut	Nunavut Land Claims Agreement	1993
	Canadian Environmental Assessment Act	1992
Federal Government	Canadian Environmental Assessment Act	1992

Source: Modified from Health Canada, 1994 (Volume 1: The Basics)

[13] See for example, British Medical Association (BMA), 1998; Birley and Peralta, 1992; World Health Organization, 1997, 1999.

That said, there is little guidance as to the scope of health in EA. Hansell and Aylin (2003) argue that such understanding is necessary if we are to effectively assess the state of health, and accurately measure and predict health impacts in EA. Health in EA arguably goes beyond the traditionally accepted field of health policy to include the health status of individuals, communities and societies affected by a wide range of project induced factors (Davies, 1992). Mahler (1981: 7) agrees, suggesting that health:

> Is influenced by a complex of environmental, social and economic factors ultimately related to each other … action undertaken outside the health sector can have health effects much greater than those obtained within it … (health) is a holistic concept calling for efforts in agriculture, industry, education, housing and communication just as much as in medicare and public health.

From this discussion, it is clear that not only should health and EA professionals be responsible for assessing health impacts, but a collaboration of expertise, including environmental, health, and community is needed. Previous research by Laws and Sagars (1994) suggests that there is a close relationship between health and the environment, and that those responsible for diagnosing health and environmental effects need to become more cognizant of the importance of the underlying health and environmental histories. This need for improved communication and collaboration between EA and health professionals permeates the literature on EA (Davies and Sadler 1997; Laws and Sagar 1994; Leaning 1994; Gibbs, 1994; Hu, 1994) and suggests that bridging the gap between the two professions is increasingly important if the state of health in EA practice is to improve.

2.2.3 Health Assessment and Health Determinants

In general, as discussed earlier, a formal EA includes five stages: screening; scoping; determining significance; mitigating; follow-up; and management recommendations. The challenge is to incorporate human health into the assessment process at each stage in order to maximize the potential benefits and minimize the potential adverse effects on human health due to proposed resource development projects. The WHO (1992), for example, expands the basic EA steps to include human health (Table 2.3). The objective is to promote good health in communities affected by

development policies and projects as well as to merge the two parallel disciplines: environmental impact assessment (EIA) and health impact assessment (HIA). The Health Determinants Framework (see Figure 1.3), outlined by Health Canada (1999), identifies nine determinants of health important to the assessment process. From these determinants, described in Table 2.4, EA practitioners attempt to ascertain the scope of health on a project-by-project basis. The Canadian Federal / Provincial / Territorial Committee on Environmental and Occupational Health (1996) suggest that though it may not be necessary to do a detailed health assessment in every EA, it is important to consider whether projects will have an effect on health – both positive and negative.

Table 2.3 Steps to an environmental health impact analysis (EHIA)

1. Project description,
2. Assessment of primary impacts on environmental parameters,
3. Assessment of secondary and tertiary impacts on environmental parameters,
4. Identification of impacted environmental parameters with health effects. Preliminary assessment of environmental health effects,
5. Prediction of exposure to environmental health factors,
6. Identification of health risk groups,
7. Estimation of predicted health impacts,
8. Identification of mitigation measures to prevent or reduce significant adverse health impacts, and
9. Final decision on acceptability of adverse health impacts and whether or not the project should proceed.

Source: WHO (1992: 143) based on Giroult (1984)

Income and social status is ranked as the most important determinant of health (Health Canada, 1999), as people perceive themselves as being healthier the higher their socio-economic status and income level (Statistics Canada, 1991). This is demonstrated by a large body of evidence, suggesting that there is a sharp gradient in health status associated with socio-economic position (Birley, 2002; Sagar, 1994). Though gender is not explicitly included within Health Canada's framework, gender-based impacts is an emerging theme in health geography, particularly when examining the determinants of health (Denton *et al*., 2004; Panelli and Gallagher, 2003; Lewis, 1998). The health status of males and females is affected differently by income and social status (Kosteniuk and Dickinson, 2003). For example, females are attributed with lower income and social status while maintaining longer lifespans and enduring the struggle of

juggling work and family obligations (Health Canada, 1999). These gender differences have been shown to negatively affect women's health with, for example, higher levels of depression, psychiatric disorders, distress, and a variety of chronic illnesses reported by women than men (Denton *et al*., 2004; Sagar, 1994). Yet, there seems to be relatively little direct attention given to gender-based health concerns in EA literature and practice.

Table 2.4 Determinants of Health

	Health Determinant	***Definition***
1	Income and social status	Health status is proportional to social status and income level. In other words, the higher the social status and income, the healthier the person. Unemployment is also linked to poorer health. The unemployed experience significantly more psychological distress, anxiety, health problems, hospitalization, etc.
2	Education	Education improves opportunities for employment, income, job security and job satisfaction
3	Working conditions	Stress related demands of the job and the frequency of deadlines contribute to poorer health. Workplace injuries and occupational illnesses also decrease health status
4	Physical environments	The natural and human built environments also contribute to health status as human health is critically dependent on the elements of the natural world (e.g. clean air, water, food, etc.)
5	Biological / Physical Health	The organic make-up of the body, the functioning of various body systems and the processes of development and aging serve as fundamental determinants of health. At the same time, certain individuals are predisposed to particular diseases or health problems.
6	Social support networks	Support from friends, family and communities can help individuals cope with daily stresses and contribute to improved health
7	Personal health practices & coping skills	Individuals' lifestyles and choices and sense of control over their lives contribute to improved health status. (e.g. choosing a balanced diet and regular exercise)
8	Healthy child development	Prenatal and early childhood experiences influence subsequent health, well-being, coping skills and competence. Canadians life expectancy have increased as a result of decreased maternal and infant death rate
9	Health services	Health services promote, maintain, and restore health.

Source: Based on Lewis (1998) and Health Canada (1999)

2.2.4 The Role of Health in EA in the North

The role of health in EA is perhaps even more prominent in the Canadian North, where Aboriginal populations dominate. Aboriginal culture[14] views the land, Mother Earth, as the giver of life (Wilson and Rosenberg, 2002). Meredith (1995), for example, notes that northern residents are often more aware of their environment and relationships to health and well-being than are those in the South. Aboriginal culture believes interconnections to exist between all elements of nature (for example plants, animals and the land), often referred to as spiritual relationships. Illness is seen as a change in these

relationships and not only attributable to direct environmental change (such as pollutants).

Aboriginal definitions of health go far beyond the accepted WHO definition to include an understanding that the state of human health forms a balance between humans and their environment (Indian and Northern Affairs Canada, 2003; O'Neil and Solway, 1990) and places a strong emphasis on community health, rather than individual health (Davies, 1992). The second Canadian Arctic Contaminants Assessment Report on Human Health (INAC, 2003), for example, purport that additional determinants of health, such as lifestyle (alcohol consumption, smoking, and substance abuse), diet, as well as socioeconomic status and genetic predisposition, should be considered when assessing the health status of northern residents.

Recent research (for example: Kwiatkowski and Ooi, 2003; Mulvihill and Baker, 2001) legitimizes the importance of and role that human health should play in northern EA practice. For example, increasing the level of economic development in any region can potentially improve the availability of, and access to, health services and resources, thus increasing the health status of residents. Health Canada (1999) suggests that projects requiring EA are expected to improve the health and well-being of residents because they create economic benefits that contribute to a better standard of living. Davies (1992), however, argues that uncontrolled development often contributes to social disruption and increases psychological and social health problems, such as

[14] The North is home to a diverse group of Aboriginal peoples, including the Inuit, Métis, and the Dene and Yukon First Nations (INAC, 2003). The term 'Aboriginal culture' therefore refers to all of these groups, however, differences between groups do exist.

family violence and alcohol abuse. Because the North is already a sensitive environment – physically, socially, and culturally – development projects need to be assessed within the context in which they are proposed, and assessments must integrate the social and cultural complexities of the local environment while weighing the economic benefits. Using socio-economic status (SES) indicators, including income, education and occupation, are one means of measuring health status across Canada. However, there are insufficient indicators within a northern context, where most of the population do not have the same access to basic services, such as health care, as do those in the South. Northern residents are typically offered employment opportunities when a new development occurs in their community; however, often attached to such development is southern technology, attitudes and social systems (Davies, 1992). The associated social problems, such as alcohol abuse and family violence that come as a result of the 'new money', often far outweigh any economic benefit.

2.3 Integrating Health into EA

Protecting human health and maximizing the beneficial effects of project development on health is one of the stated goals of EA practice in Canada (INAC, 2003). Incorporating health impacts within the EIS of development projects provides a way to assess the often secondary impacts to human health. A workshop by the Central European University (CEU) concluded that fully integrating SIA and HIA into EIA enables practitioners to assess all the associated interactions and is therefore facilitates more holistic and effective assessment (Bellinger *et al*., 2000). However, the literature suggests that as the definition of 'environment' broadens so too must the scope of EA to include human health effects (Martin, 1986).

Hayes (1999) reports that there has been a shift in health geography from assessing individual risk factors and causes of particular diseases to a life course perspective on health and well-being, independent of specific diseases. This evolution is indirectly applied to improving health integration in EA practice. Wilson and Rosenberg's (2002) study on the determinants of health for First Nations peoples across Canada highlights the divide between epidemiologic research (quantitative) surrounding the prevalence of illness and disease and the cultural research (qualitative) on the First

Nations peoples' traditional activities and differing cultures as they relate to health. Embracing the individuality and profound impact culture has on peoples' health is necessary to improve EA practice in the future. Merging these two procedures should, according to the WHO (1992: 1):

> … lead to the identification of alternative development polices or projects less detrimental to health and the environment, and/or the provision of mitigation measures to compensate for potential environmental health impacts.

In this context, EA has been described as the "interface between natural resources and the production of activities on one side, and the main component of the human environment such as air, water and food on the other" (WHO, 1992: 132). The main reason why human health should be included within EA, according to the WHO, is that the "real" significance of environmental effects is not currently being assessed, and the assessment of human exposure to environmental parameters is missing from the general approach to environmental and health impact assessments (WHO, 1992). Davies states in her background paper prepared for the CEARC, entitled *An Introduction to Human Health and Environmental Assessment in Canada* (1992: 8), that:

> Environmental assessment can be seen as a necessary, but not sufficient, process for achieving and promoting human health and sustainable development.

This remains true today. Though our knowledge and acceptance of EA processes continue to grow, EA remains insufficient in Canada. Focusing attention on Canada's North can provide further insight as to how to effectively incorporate health into EA practice.

2.3.1 Integrating Health into EA in the North

Ensuring that proper measures are taken to protect health prior to approval of any development project is a prerequisite to responsible management practice. This is particularly the case in the North, where rates of illnesses, such as those associated with substance abuse, are higher, further indicating that assessment of such effects on the social well-being of northern peoples is critically important for a comprehensive understanding of the total effects of northern development projects (Health Canada,

1996; ADB, 1992; O'Neil and Solway, 1990; Mao *et al.*, 1986). Development in the North has traditionally been at cost to northern residents; in other words, the benefits of development rarely outweigh the environmental and social costs (Young, 1995). For example, a recent study by the GNWT (2000: 2) on the impacts of mining developments on northern community health and well-being states:

> Most (large) projects…are expected to have beneficial effects on health and well-being because they create jobs and provide other economic benefits that contribute to a better standard of living….They also have the capacity to cause adverse effects on health and well-being at the individual and community level…..Social and community health may…be affected negatively where individuals face a loss of cultural identity and quality of life, social disruption and violence, and a breakdown of community and family support networks. Furthermore, socio-cultural well-being can be affected by increasing stress, anxiety and feelings of alienation.

Spiritual health, extremely important in the North[15], is rarely considered in EAs (O'Neil and Solway, 1990) as such consideration is dependent on the willingness and judgement of the EA practitioner (Davies and Sadler, 1997; Laws and Sagar, 1994). In the CEARC's 1987 survey of factors that determine how much emphasis is placed on human health, EAs for development projects located in northern rural areas were found to be less likely to assess potential human health effects than those located in more populated areas (for example, southern urban centers) (Davies, 1992; Canadian Public Health Association, 1987).

It is important to note that Canada's northern population (including the three northern territories) is comprised of over 53 percent Aboriginal[16] people, compared to only a 3.3 percent national average (Figure 2.2). This is an important demographic characteristic as Aboriginal peoples have the poorest health status among Canadians (Health Canada, 1999), and experience significantly higher infant death rates and much higher disease rates (Statistics Canada, 1997). In addition, many northern residents rely

[15] In the Aboriginal context, spiritual health is considered by many Native people to be not only intrinsic to general physical, social and psychological well-being, but is fundamentally linked to relationships with the land (O'Neil and Solway, 1990: 14).

[16] The term 'Aboriginal peoples' is an inclusive term used to describe the descendants of Canada's original inhabitants. Three groups of Aboriginal peoples are recognized by the Canadian Constitution, namely: the Inuit, the Métis and the First Nations, which in the Arctic include the Dene and Yukon First Nations (INAC, 2003).

on traditional or country foods as their primary food source. These foods maintain an important social and cultural fabric among individuals that supports community health and well-being (INAC, 2003).

Reports of contamination of traditional food sources potentially threaten human health. According to INAC (2003), for example, levels of organochlorine contaminants in human tissue in the Arctic are considerably higher than those in southern Canada. To that end, John O'Neil (1990), a medical anthropologist, contends that not only should health be an integral part of EA, but no project should be approved in the North unless it *improves* the health status of nearby communities. His argument is based on the fact that northern communities are already under stress, and unless development is going to improve their current health status it should not be considered. The Asian Development Bank (ADB) (1992) agrees, suggesting that all development projects should provide the opportunity for health promotion.

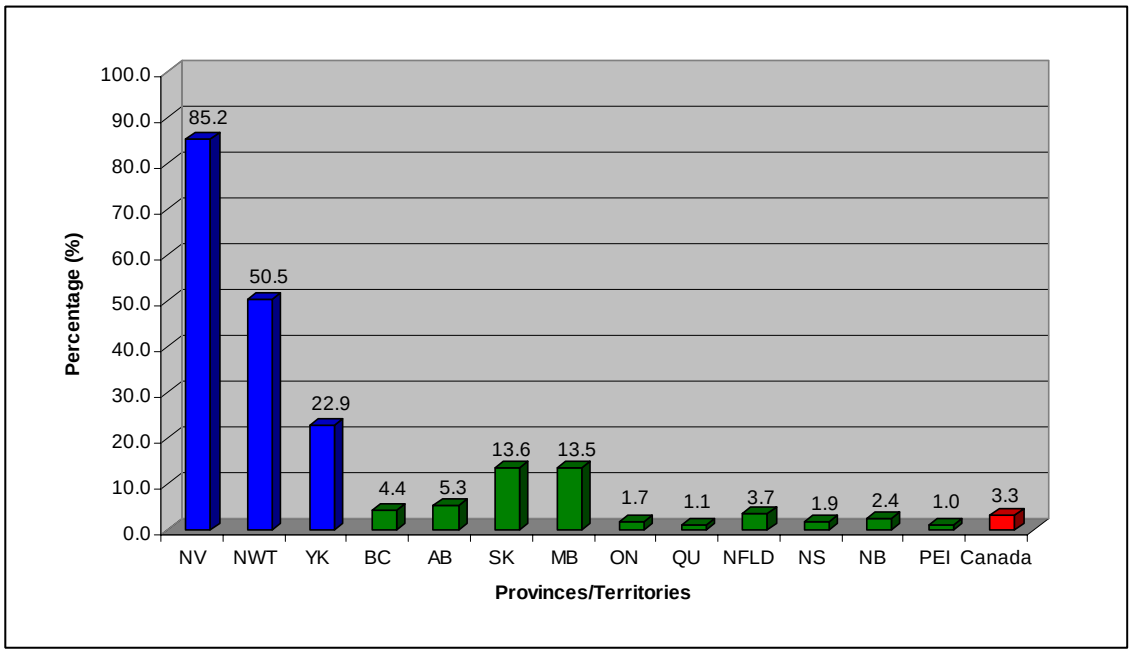

Figure 2.2 Percentage of Aboriginal population per province/territory
Source: Statistics Canada, 2001

2.4 Barriers to Health Inclusion in EA

In her comparison of the development ideologies shared by Australia and Canada, Young (1995) illustrates that development in remote regions of countries characterized by vast geographic size, concentrated populations, and rich in non-

renewable resources, has resulted in resource exploitation as well as human and environmental degradation. The drive to open the Canadian North for economic development increases the need to effectively integrate health considerations, specific to those living in the North, into the EA process. Humans are merely one part of complex northern ecosystems. Changes in the environment can affect different people in different ways. The complexity of human health effects themselves is thus a main barrier to the incorporation of health into EA practices (Davies, 1992; Martin, 1986).

Establishing direct cause and effect relationships between development projects and human health impacts is often an impossible task. This is especially true if numerous development projects exist in a relatively small geographic area. Moreover, even if human health effects are caused by measurable individual chemical concentrations in the environment, the effects on human health due to synergisms and combinations of chemicals is largely unknown (INAC, 2003). Thresholds and standards are set in order to protect human health, however not all chemicals have such standards. In short, this means that even full compliance does not always mean human health is protected (Davies, 1992). Another primary barrier noted in the literature is the qualitative nature of human health effects. As noted earlier, assessing the psychological, spiritual, and social health and well-being is much more difficult than assessing physical determinants (Davies, 1992). Establishing the spatial and temporal boundaries when predicting human health impacts, also pose problems for practitioners (João, 2002). Not only can effects take place over long distances from the point source, they may also be delayed or occur over long periods of time. In many cases, the longer-term and cumulative effects of projects on health have not been studied and are therefore near impossible to predict in current EA practice.

2.5 Northern EA Case Studies

Large-scale resource development projects are controversial in the North due to a predisposition to adverse environmental effects and negative social impacts (Bone, 2003). The North is particularly sensitive to adverse environmental impacts caused by resource development for three reasons: 1) the physical environment of the North is sensitive due to the existence of permafrost and is therefore more easily damaged by

industrial activities and its effluents, 2) the North's cold biological regime requires a much longer time for the environment to repair itself, and 3) the global atmospheric and oceanic circulation systems bring industrial pollutants to the North (Bone, 2003; Downie and Fenge, 2003). Bone (2003) outlines the disadvantages of constructing megaprojects within the North, including:

- profits flow out of the North;
- manufacturing of special facilities or equipment takes place in southern Canada;
- managerial experience and technical knowledge gained from the development are retained by the company;
- public funds are often used to encourage such developments, thereby reducing their risk and enhancing their prospects of profitability but doing little for the North; and,
- the influx of workers without ties to the community can cause social problems as neither the community nor the workers are able to cope successfully with this sudden demographic change.

In order to set an appropriate context for the state-of-practice assessment, it is important to acknowledge previous development projects in the North and their experiences with regard to health integration. The following section is based on Noble and Bronson (2004) and introduces three development projects in the North (Figure 2.3), each selected to illustrate how human health has been integrated into EA practices in the mining resource sector. First, three important projects in the uranium mining industry in northern Saskatchewan are examined, namely: the Rabbit Lake mine and current Eagle Point extension, the recently decommissioned Cluff Lake mine, and the McArthur River project. Second, Canada's first diamond mine, the Ekati Diamond Mine, located 300 kilometres north of Yellowknife in Canada's Northwest Territories is examined. Third, the Voisey's Bay Nickel Mine and Mill, located on the east coast of Labrador is addressed.

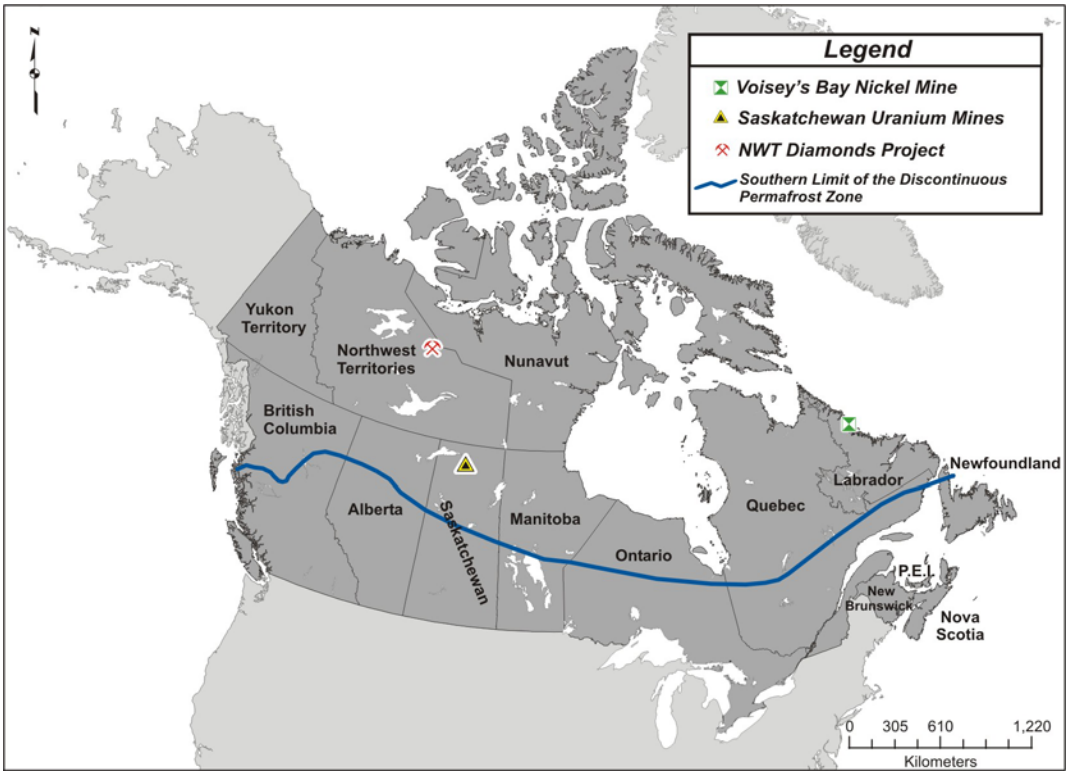

Figure 2.3 Northern EA case studies

These cases are based on reviews of project impact statements and related project documents. They are not intended to represent 'best'-practice examples of health assessment in northern EA, rather they serve to illustrate 'real world' examples of health integration in EA within northern environments. Each serves to illustrate particular issues concerning the integration of health in EA, and taken together, they illustrate the evolution of health assessment in northern EA practice, and set an appropriate context for the state-of-practice survey.

2.5.1 Uranium Mining in Northern Saskatchewan

Uranium mining in northern Saskatchewan began in 1968 with the discovery of the first major uranium deposit at Rabbit Lake in the Athabasca Basin. Since then, the Athabasca Basin has remained the world's premier exploration region for and supplier of high grade uranium deposits (Gunning *et al*., 2004). Today, the Basin includes the McClean Lake, Midwest, Cigar Lake, McArthur River, and recently decommissioned Cluff Lake mine, as well as the world's largest uranium mill, located at Key Lake (Figure 2.4). Initiated in 1975, Rabbit Lake is the longest operating uranium production

facility in Saskatchewan. In 1987, following the discovery of an additional radioactive occurrence in the Rabbit Lake area, Cameco Corporation submitted an EIS to federal and provincial regulatory agencies for approval to mine three new ore bodies, including the Eagle Point Extension.

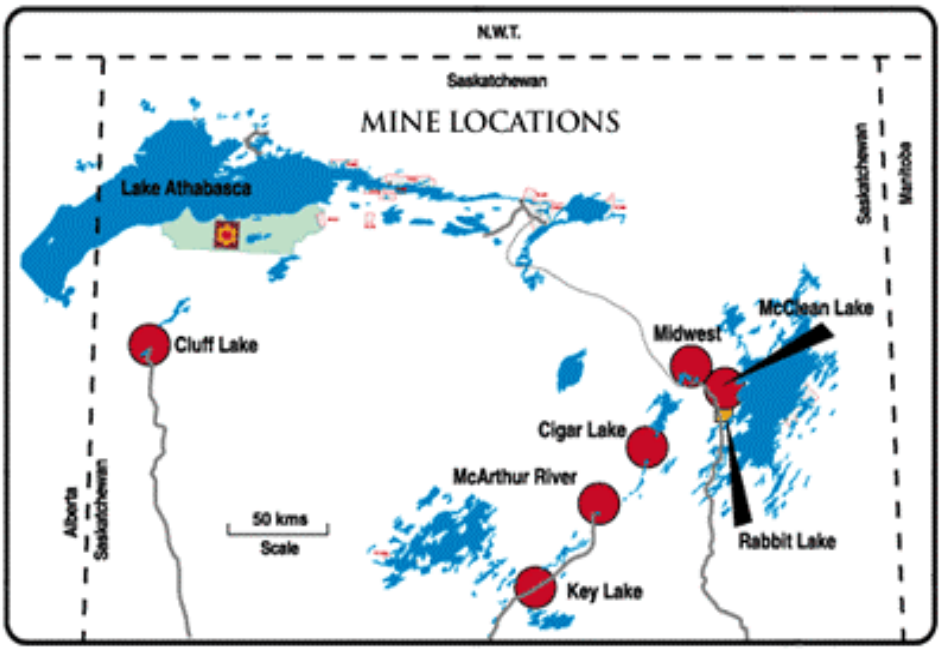

Figure 2.4 Northern Saskatchewan uranium mines and mills
Source: Cogema Resources Incorporated (www.cri.ca)

The environmental effects of the proposed Eagle Point Extension development project were determined by the Atomic Energy Control Board of Canada, now the Canadian Nuclear Safety Commission, to be mitagable and subsequently approved the project for development. Four years following Cameco's application for development, a joint federal-provincial EA Panel was appointed to examine the environmental, health, and socioeconomic effects of uranium mining activities in northern Saskatchewan, including the Eagle Point Extension and initial Rabbit Lake mine projects. The primary concern of the Panel was the contamination of the biophysical environment and subsequent exposure pathways to radionuclide and heavy metals; also identified as the primary health concern in the initial project impact statements. In its review, the Panel found that even after a decade of biophysical environmental monitoring in the Rabbit Lake area, there were no comparable, consistent data to determine the actual impacts of

mining operations on human health. The Panel concluded that Cameco's monitoring program failed to provide assurance to northern residents, those most affected by the project, as to the effects of the project on local fish populations – a resource of considerable importance to health and social well-being (Rabbit Lake Uranium Mine Environmental Assessment Panel, 1993).

The narrow, biophysical scope of health in the Rabbit Lake EA permeated similar assessment practices in the region, including the Cluff Lake EA and safety report submitted to the Saskatchewan Department of Environment in 1976. Similar to the Rabbit Lake project, the scope of health in the Cluff Lake assessment was restricted to the physical components of health impacts, and focused primarily on the risk of mine worker exposure to radiation. The challenge of addressing a broader range of health concerns in EA practices was reflected in the Final Report of the Cluff Lake Board of Inquiry (1978), which explicitly recognized the difficulty of assessing the social health impacts of uranium mining activities on northern residents, suggesting:

> There now exists in the north (and it has nothing to do with uranium mining) a social disorder…To superimpose upon that kind of society a project such as a uranium mine and mill which has the potential of exacting additional social costs and then try and measure those additional costs presents a near impossible task (Cluff Lake Board Report, 1978: 174).

For the most part, social health impacts were not addressed in the Cluff Lake project due to the social complexity of northern communities and the lack of causal impact links. What were addressed included the health impacts that the proponent had direct control over, namely employment, investment and business opportunities. The more recent Cluff Lake decommissioning comprehensive study report (CNSC, 2003) continues to reflect the emphasis on physical health, with the primary health related issues addressed in the report concerning potential exposure to radiation due to direct and indirect ingestion of contaminated water on sites of traditional land use and hunting activities.

The McArthur River project, approved in 1997 by the joint Federal-Provincial EA Panel, began operations in late 1999 and continues to be the world's most productive, highest grade uranium mine. In comparison to the Rabbit Lake and Cluff Lake experiences, the scope of health considered in the McArthur River EA and Panel

Report reflects well on the EA process and on the WHO's (1987) conceptualization of health to include social well-being and quality of life, recognizing the links between health and various physical and social health determinants. Health impacts of uranium mining activities were assessed within this broader conceptualization of health, including cumulative health effects, and emphasis placed on three health-based monitoring and assessment programs, including physical health effects based monitoring of environmental contaminants, epidemiological assessment, and community health assessment of employment, income, education, housing, lifestyle, and traditional land use activities of northern residents (McArthur River Panel Report, 1997). It is important to note that 'traditional land use activities' is not included as part of Health Canada's determinants of health framework (Figure 1.3).

2.5.2 NWT Diamonds Project

In 1994, the Canadian Department of Indian and Northern Affairs and Northern Development initiated an environmental review of Canada's first diamond mine, 300 kilometres northeast of Yellowknife in the Northwest Territories (NWT) (Figure 2.5). The proponent, BHP Billiton (BHPB), submitted an assessment document in 1994, followed by a full Panel Review. Project scoping meetings were held in early 1995 from which the public review Panel made a number of recommendations to BHPB Ekati concerning health and socio-economic environments, including recommendations to consider social and cultural traditions, land use patterns, physical health, demographics, education and employment, and public social services and infrastructure. Based on review of BHPB's impact statement the Panel concluded that the project would be of significant benefit to northerners and that the predicted impacts of the project could be mitigated. This case study coincides with O'Neil and Solway's (1990) contention that no northern project should go ahead without *improving* health. Twenty-nine recommendations were made by the review Panel to ensure that environmental, health and socio-economic issues were identified by the proponent and managed appropriately. Included amongst the proponent's response to the Panel's recommendations was local job creation, community meetings and cross-cultural training to identify cultural concerns and minimize potential conflicts between northern

residents and outside workers, education and employment training programs, and community-based committees to deal with emerging social health problems (Kwiatkowski and Ooi, 2003).

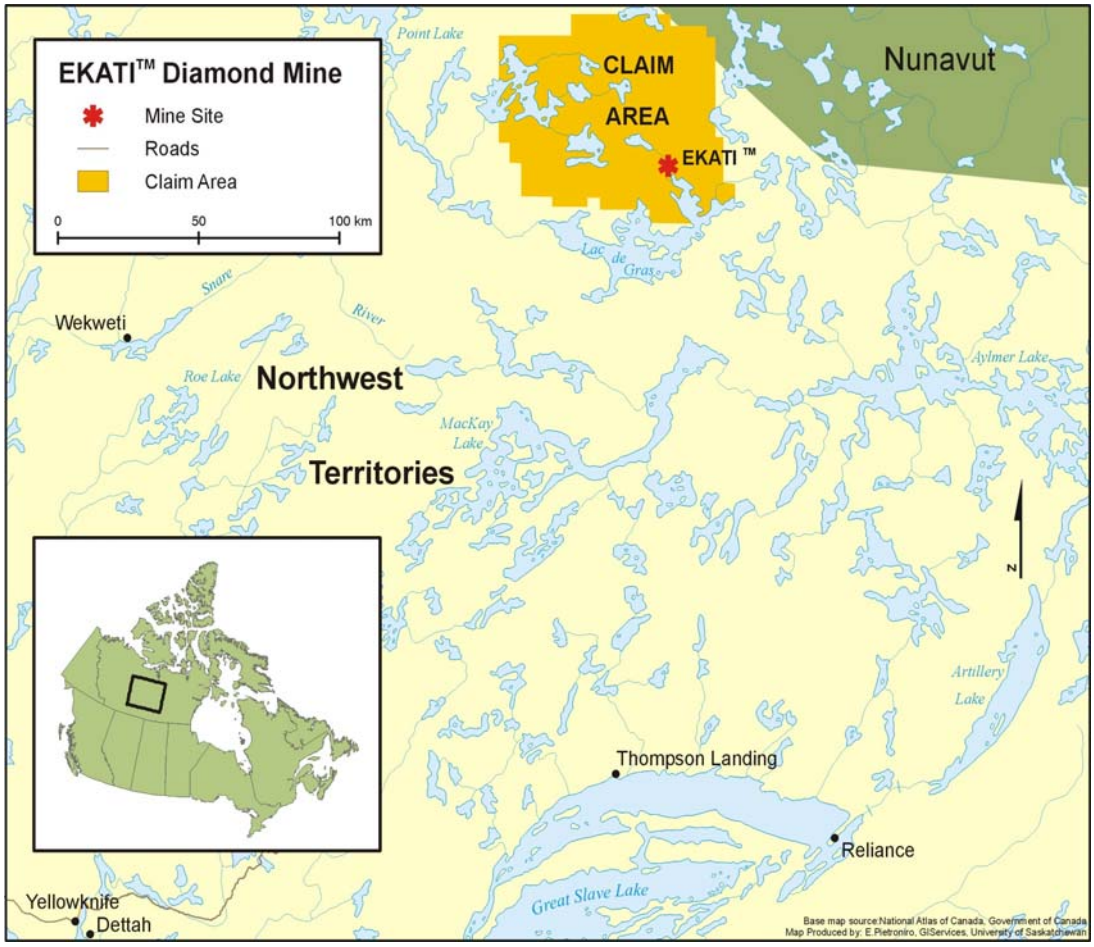

Figure 2.5 Ekati Diamond Mine, Northwest Territories

There are however, three critical issues concerning social and community health that emerge from BHPB's Ekati mine assessment. First, notwithstanding BHPB Ekati's commitment to local communities, the EA process failed to address if, when, and how mining could contribute to longer-term community health and sustainability beyond the life of project employment. Second, the nature of employment, its scheduling, and distance of the mine site from home communities created a situation in which the benefits of employment may be offset by the costs of social and family disruption and loss of opportunities to participate in traditional lifestyles and activities (Wismer, 2000). Third, while the Ekati project is recognized as a benchmark in Canadian northern EA

with regard to its follow-up commitment and appointment of an Independent Environmental Monitoring Agency (IEMA), the selection of health and social indicators for follow-up programs are based on Territory-wide data, and may be too coarse to adequately detect real impacts in those communities most affected by mining activities (Noble and Storey, 2005). For example, practitioners often rely on existing data due to time constraints however, in frontier areas such as the Ekati Diamond Mine, existing data can be minimal, thereby limiting the value of processes to verify the accuracy of impact predictions.

2.5.3 Voisey's Bay Mine/Mill

In 1993, a rich nickel-copper-cobalt deposit was discovered at Voisey's Bay, northern coastal Labrador (Figure 2.6). The proponent, Voisey's Bay Nickel Company Limited (VBNC), a subsidiary of Inco Limited, submitted in 1997 a proposal for the development of a proposed mine/mill complex and related infrastructure to produce mineral concentrates at Voisey's Bay. Similar to the BHPB Ekati and McArthur River projects, the Voisey's Bay project reflects well on the scope of health. In absence of a land claim agreement, specific guidelines were to be followed by the proponent under a memorandum of understanding[17] (MOU), established between the federal and provincial governments and the Labrador Inuit Association (LIA) and the Innu Nation, when preparing its impact statement, including consideration of traditional land use activities, housing, quality of life, health, diet and country food dependency (Voisey's Bay Panel Report, 1999). In addition, the proponent was required to go beyond merely demonstrating that environmental factors were considered during the planning phase and any adverse impacts mitigated, but that the proposed activities would contribute positively at the local and regional level (Gibson, 2002).

[17] An MOU is a document which provides a description of the responsibilities that are to be assumed by two or more parties in their pursuit of some goal(s). See http://www.ceaa.gc.ca/010/0001/0001/0011/0004/mou_e.htm.

Figure 2.6 Voisey's Bay Nickel Mine, Labrador
Source: Voisey's Bay Nickel Company Limited (www.vbnc.com)

The Voisey's Bay EA is noteworthy from a health perspective for at least two reasons. Voisey's Bay was the first project within Canada's North to explicitly adopt a sustainability mandate[18]. In the impact statement guidelines for the project proponent, the Voisey's Bay Panel explicitly identified the sustainability criterion noting that EA should go beyond minimizing damage and require that an undertaking maximize long term, durable net gains to the communities affected (Voisey's Bay Mine and Mill Environmental Impact Statement, 1997). Second, the Voisey's Bay case is unprecedented with regard to the Panel's requirement to incorporate gender-based issues, including gender-based health concerns, in the project assessment. That being said, Archibald and Crnkovich (1999) highlight some limitations to the land claim negotiation process, in that it is predominantly male negotiators participating, therefore limiting the scope of the land claim agreements to only one gender, when in reality, the problems associated with development affect the whole family. The Voisey's Bay case is therefore also a step backwards in many respects, in that while there existed an

[18] The Mackenzie Valley gas project has since adapted a sustainability mandate, the second of its kind in the North.

explicit mandate for the project to make an overall positive contribution, there was very little attention given to the direct health impacts of the project on mine employees, and very little actual *assessment* as to how differential impacts might actually affect the health of Inuit women.

2.6 Summary

Kwiatkowski and Ooi (2003) suggest environmental health is clearly an important aspect of a community's health, but it is not the only determinant. According to O'Neil and Solway (1990) assessments of health effects must adopt a multidimensional or "holistic" view of health, and must acknowledge effects at the community level, as well as the unique environmental, economic, socio-political, and cultural realities, in order to be effective in the North. Lessons learned from previous development projects in the North demonstrate this need to broaden the scope of health from focusing predominantly on the physical components of health impacts (i.e. the risks of radiation exposure) to include the environmental, social, economic and cultural realities simultaneously. Though some projects excel in certain areas (for example, the incorporation of gender-based issues in the Voisey's Bay EA), others fail to look at the long-term sustainability of the project (for example, the Ekati diamond mine project), despite the proponent's commitment to sustainable development. The case studies presented above provide an overall glimpse into northern assessment practices, and illustrate the need to learn from and improve upon health integration in EA.

Direct, indirect and cumulative health and health-related impacts need to be identified in EA based on the determinants of health, and a more pro-active and contextually relevant approach to impact management needs to be adopted. This could be done by proposing measures to avoid or mitigate potentially negative health impacts, but also to create or enhance positive ones. The success of the assessment process however, depends largely on integrating health impacts from scoping to follow-up, to ensure the actual impacts are considered and negative impacts mitigated. What is now required is an evaluation of the state-of-health and EA practice within the North, and recommendations from experience for moving forward in this regard.

CHAPTER 3
RESEARCH METHODS

3.0 INTRODUCTION

The purpose of this research is to assess the current state of health integration in EA practices in Canada's northern regions. To that end, a combination of methods is used to explore practitioner's and administrator's experiences with health and EA in the Canadian North. This research adopts a concurrent mixed method approach in that quantitative and qualitative data are combined in order to provide a comprehensive analysis of the research problem (Creswell, 2003). This chapter describes the research methods used in this investigation. It begins with a discussion of quantitative, qualitative and mixed methods research in general, followed by a description of the specific data sources. Two research methods are then discussed, namely: a mail-out questionnaire survey and semi-structured interviews.

3.1 Mixed Methods

3.1.1 Quantitative Research Methods

A quantitative approach is defined as one in which the investigator primarily employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data (Creswell, 2003). Experimental research uses the logic and principles found in natural science research and can be conducted in laboratories or in real life (Neuman, 1994). A survey researcher, on the other hand, uses a written questionnaire (mailed or in person) to ask people questions, and then records and analyzes the answers (Neuman, 1994). Surveys enable the researcher to gain a 'picture' of what many people think in a short period of time and are often used in either a descriptive or explanatory way (Neuman, 1994).

Limitations do exist, however. For example, most techniques require the data to meet a number of assumptions such as assuming the sample values have a normal distribution (Mitchell, 1989). These assumptions are, for the most part, limited to

parametric techniques. The data obtained from the questionnaire administered in this thesis, however, are suited primarily to non-parametric and exploratory tests, both of which are distribution-free and do not involve assumptions about the population (Ebdon, 1999). Mitchell (1989) contends that the level of measurement (nominal, ordinal, interval, and ratio) is more important than the type of technique, as the quantitative-qualitative dichotomy is an artificial one since all data can be collected in a 'quantitative' form. Philip (1998) agrees, concluding that qualitative and quantitative approaches are not mutually exclusive and thus a place exists for research in which they are combined. A questionnaire is one example of a quantitative and qualitative application used in the social sciences (Converse and Presser, 1986), and is deemed a useful tool for this research.

3.1.2 Qualitative Research Methods

A qualitative approach, defined by Marshall and Rossman (1999), is a broad approach to the study of social phenomena; its various genres are naturalistic and interpretive, and they draw on multiple methods of inquiry. Qualitative research methods are increasingly used by geographers to promote detailed understanding of socio-spatial experiences (Winchester, 2000; WGSG, 1997; Cook and Crang, 1995; Pile, 1991). Various types of qualitative approaches exist for researchers (see, for example, Wolcott, 2001). Generally, these include documents, surveys, interviews, focus groups, and ethnographies (Morse and Richards, 2002; Winchester, 2000). The range of qualitative methods is typically used to answer two types of research questions, relating either to the experiences of individuals or to the social structures within which individuals or groups are situated (Winchester, 2000). The value of qualitative methods is greatest when little research has been done on the particular concept or phenomenon (Creswell, 2003). In the context of this research, there has been very little inquiry to date concerning the extent to which 'health' is integrated into EA practices, particularly in Canada's northern regions where EA itself remains significantly underdeveloped (Mulvihill and Baker, 2001). Qualitative methods are therefore appropriate for examining experiences with EA in the North. That said, it is increasingly recognized that using only qualitative methods can be limiting because qualitative research

sometimes focuses too closely on individual results and fails to make connections to larger situations (Winchester, 2000). As a result, contemporary researchers are more commonly using quantitative research methods in conjunction with qualitative ones.

3.1.3 Mixed Methods

Table 3.1 categorizes the three different approaches commonly adopted by researchers. The principal aim in choosing a research method is to maximize the strengths and minimize the weaknesses relative to the problem (Mitchell, 1989). Both quantitative and qualitative research methods have their own strengths and weaknesses; however, using a combination of both techniques is meant to capture the best of both approaches (Creswell, 2003). Tashakkori and Teddlie (2003), for example, highlight three areas in which mixed methods are superior to single approach designs, namely:

a) mixed methods research can answer research questions that the other methodologies cannot;

b) mixed methods research provides better (stronger) inferences; and,

c) mixed methods provide the opportunity for presenting a greater diversity of divergent views.

This research adopts a mixed methods approach as the most informed means to investigate the research questions. Primary data collected from a questionnaire are combined with semi-structured interviews to form the basis of data for examining the state-of-practice of health integration in Northern EA. The following sections review the primary objectives of this research, and describe the mixed method approach research design.

Table 3.1 Quantitative, Qualitative and Mixed Methods Procedures

Quantitative Research Methods	***Qualitative Research Methods***	***Mixed Methods Research Methods***
Predetermined instrument based questions; Performance data, Attitude data, Observational data, And census data; Statistical analysis	Emerging methods; Open-ended questions Interview data, Observation data, Document data, and Audiovisual data; Text and image analysis	Both predetermined and emerging methods; Both open-ended and closed-ended questions; Multiple forms of data drawing on all possibilities; Statistical and text analysis

Source: Creswell, 2003: 17

3.2 Data Collection: A Two-Tiered Approach

This research has four objectives, to:

1) identify the provisions for health impact assessment under northern environmental assessment systems;

2) identify 'health determinants' for consideration in project assessment as outlined by Health Canada and related health literature;

3) evaluate the state-of practice of health in EA based on a survey of practitioner experiences with case studies across northern Canada; and,

4) determine, based on state-of-practice results, if additional determinants need to be considered when assessing the health impacts of projects in northern environments.

Figure 3.1 illustrates the sequence of data collection for this research. The first objective is realized based on a review of the *Canadian Environmental Assessment Act* and Federal/Provincial and Federal/Territorial agreements, literature on health and EA (specifically, McCarthy *et al*., 2002; Canadian Federal/ Provincial/Territorial Committee on Environmental and Occupational Health, 1999; BMA, 1998; Davies and Sadlar, 1997; CEAA, 1992) as well as literature on EA in the North (Bone, 2003; Kwiatkowski and Ooi, 2003; Mulvihill and Baker, 2001; Peters, 1999; Scott-Samuel, 1998; Duerden, 1992; O'Neil and Solway, 1990; Reed, 1990; Fenge and Rees, 1989).

The second objective is realized based on a review of the framework developed by Health Canada on the Determinants of Health (see Figure 1.3) as well as literature on HIA and SIA. This is detailed in Chapter 2, where the determinants were reviewed for their importance and inclusion in project assessment requirements under federal regulations. The third and fourth objectives are realized using two principal research techniques. The first is a mail-out questionnaire survey, and the second is a semi-structured interview process. The former is targeted at EA practitioners and administrators, while the latter, health professionals and researchers – all having experience with health and resource development projects in the North.

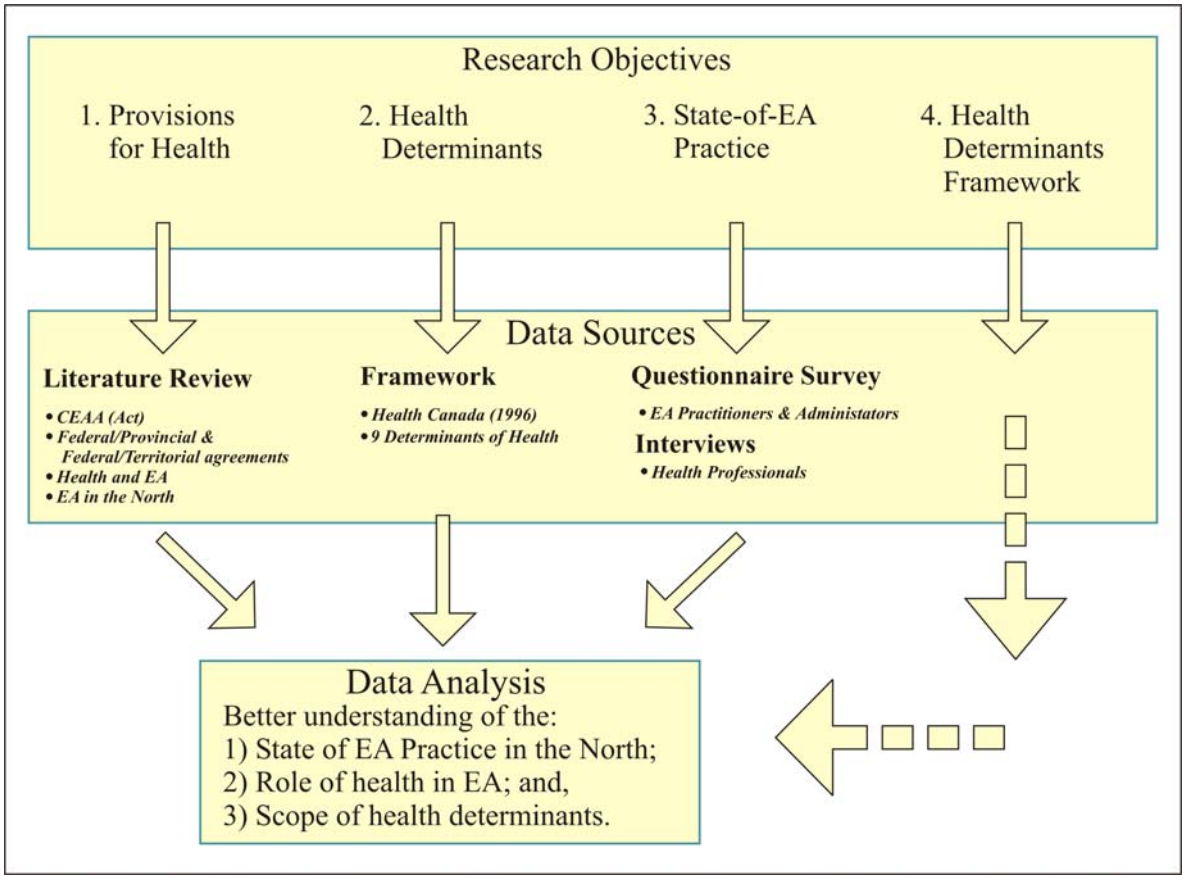

Figure 3.1 Conceptualization of Thesis

3.2.1 Mail-Out Questionnaire Survey

Questionnaire surveys were sent to EA practitioners and administrators with experience in northern resource development. The purpose of the questionnaire was to investigate the scope of health in the North based on EA practitioner's and administrator's experience. In this regard, emphasis was placed on the scope and adequacy of the tool itself (i.e. the environmental assessment process), as a means to address potential health impacts from project development. The questionnaire was comprised of both interaction matrices, detailed checklists, and open-ended questions targeted at professional experiences and judgement (Appendix A). To further enhance the quality and relevance of the questionnaire, the researcher contacted an individual from Environment Canada as well as an individual from the Saskatchewan Population Health and Evaluation Research Unit (SPHERU) to independently review the questionnaire. Their comments were reviewed and integrated prior to the initial

mailing. Concerns raised by the independent reviewers included format and language suggestions as well as time requirements.

A mail-out questionnaire survey was important for three main reasons. First, questionnaires provide information that cannot be measured or detected through traditional means (Davies, 1992), such as systematic evaluation of the EA process and its effectiveness for health integration, including potential patterns that may be 'hidden' in the data and only observable through exploratory analysis. Second, EA practitioners are very familiar with completing such exercises, as they are commonly applied in the actual practice of EA. Third, not only does this type of approach allow more time for the respondents to provide detailed answers, it enables more participants to be included within the study, and is shown by Burris and Canter (1997) and Creswell (2003) to be an effective choice. One of the limitations associated with this type of methodology, however, is that the results are dependent on the experts selected in the study and their knowledge of, and experience with, EA (Noble, 2003). Another potential shortcoming is that the data are not necessarily representative of all northern EA practitioners and administrators experiences as the population itself is unknown. However, the intent of this research is not to statistically represent all EA practitioners rather, the objective is to select participants such that a sufficient range of experiences and perspectives are acquired.

3.2.1.1 Questionnaire Sampling Methodology

Though the majority of assessments in Canada are screenings[19], this research focuses on large-scale development projects taking place in the North (i.e. projects subject to comprehensive studies or panel reviews). Therefore, a range of participants from different development projects were purposely identified through environmental assessment documents, such as EISs and panel reports related to northern EA case studies within the mining and energy resource sector (Table 3.2); others were subsequently recommended by initial study participants. The EA cases were restricted to enable the researcher to meet time restrictions while maintaining an adequate number of cases appropriate to the North. Nine large-scale northern development projects in the

[19] See discussion on the four types of assessment under the *Act* in Section 1.1.

mining and energy resource sector were used to identify initial participants, from which other potential participants were identified.

Table 3.2. Northern development projects

Development Project[a]	Province / Territory	EA Type[b]
Voisey's Bay Nickel Mine and Mill	Newfoundland and Labrador	Review Panel
Cigar Lake Uranium Mine	Saskatchewan	Review Panel
McLean Lake Uranium Mine	Saskatchewan	Review Panel
Cluff Lake Uranium Mine Project	Saskatchewan	Review Panel
Cluff Lake Decommissioning Project	Saskatchewan	Comprehensive Study
Beaufort Sea Oil Development	Northwest Territories	Comprehensive Study
Ekati Diamond Mine	Northwest Territories	Review Panel
Diavik Diamond Mine	Northwest Territories	Comprehensive Study
Cheviot Coal Mine Project	Alberta	Review Panel
Mackenzie Gas Project	Northwest Territories	Review Panel

[a] For more information on these projects, visit http://www.ceaa.gc.ca/010/index_e.htm

[b] A 'comprehensive study' EA is used for projects which tend to be large in size, having the potential for significant adverse environmental effects. These projects are listed on the *Comprehensive Study List Regulations*. If it is found that the environmental impacts of a proposed project require further study, or that the project will cause significant adverse effects, or where there is public concern, the minister must refer the project to a review panel or mediator for further study, while a 'review panel' is a group of experts selected on the basis of their knowledge and expertise and appointed by the Minister of the Environment to review and assess, in an impartial and objective manner, a project with likely adverse environmental effects. A panel allows the proponent to present the project to the public and explain the projected environmental effects, and provides opportunities for the public to hear the views of government experts about the project. See http://www.ceaa.gc.ca/010/basics_e.htm#comp.

Potential participants were grouped into five types, namely:

- Federal Authorities. In Canada, federal EAs are required for projects involving federal land, federal funding, federal proponents, or certain federal permits. The administrators and regulators of the *Act* are therefore included under federal authorities.

- Provincial Authorities. Some projects trigger both the federal and provincial EA laws. Therefore, provincial authorities with experience in the North[20] form a distinct group in this research.

- Territorial Authorities. Certain regions of the North have implemented their own environmental acts, which in some cases, takes the place of the *Act*. This includes authorities responsible for implementing EA under the MVRMA, the YESAA and the NLCA (discussed in Chapter 1).

[20] The southern limit of the discontinuous permafrost zone includes the northern parts of some provinces (see Figure 1.5).

- Consultants and Proponents. Consultants and proponents include either individuals representing consulting firms, public agencies or private companies involved in the practice on northern EA.

- Others. This group includes members of review panels, special interest groups, non-direct academics, personal or professional interest, as well as representation from First Nations and Aboriginal groups. These are individuals who may have been involved in EA, but not directly in its regulation or implementation.

The affiliation's of potential participants is depicted in Figure 3.2, which shows the majority comprised of 'federal authorities', 'consultants and proponents' as well as members of the 'other' category, consisting of special interest groups, non-direct academics, personal or professional interest, and representation from First Nations and Aboriginal groups.

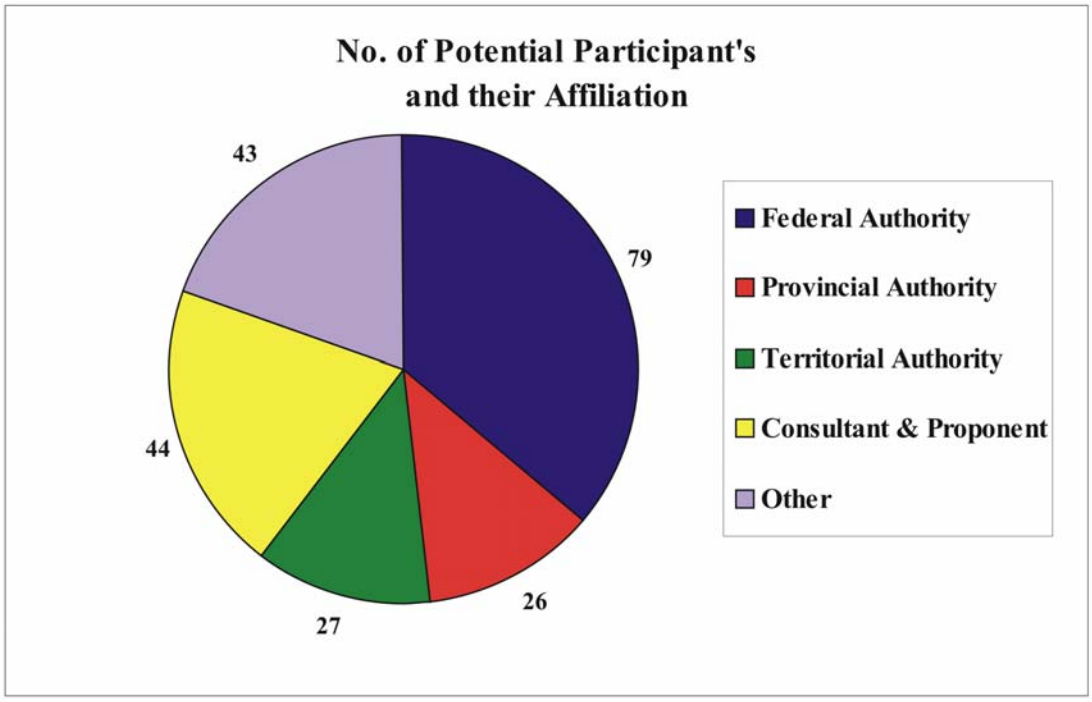

Figure 3.2 Potential participant's affiliation

Once the sample was identified, several steps were followed to administer the questionnaire. In general, Salant and Dillman's (1994) administration process was followed. The first phase included a personalized cover letter inviting the individual to participate in the study along with a brief introduction of the research and ethical considerations. For the purposes of time, the cover letter was accompanied by the

'statement of consent,' a one-page description of the conditions of participation; a map of the study area (geographic limitations); as well as the WHO's definition of health and the nine determinants of health, to address the issue of variation in provincial, federal and territorial definitions of health. The actual questionnaire followed, comprised of five sections and thirty-one questions in total (refer to Appendix A for a sample of the mail-out questionnaire). This questionnaire 'package' also contained a self-addressed stamped envelope for participant's convenience in returning the survey.

Two weeks after mailing the questionnaire package, all potential participants received a follow-up telephone call to confirm that they had received the package, to answer any questions that they may have had, and to ascertain their interest in participating. If the individual was willing to participate, a second follow-up call or electronic mail (E-mail) was placed within two to three weeks after to ensure a high response rate and that participant's were given ample opportunity to have any questions resolved. In addition, all participants received an E-mail confirming receipt of their completed or partially completed questionnaire.

3.2.1.2 Questionnaire Participation Rate and Composition

Initially, 177 potential participants were contacted by mail (one by E-mail), and from these, 42 additional potential participants were identified as having EA experience in northern Canada. In total, the questionnaire was sent to 219 EA practitioners and/or administrators across Canada, and one from the United States, between February 23rd and May 4th, 2004. One hundred and seventy-six initial surveys were sent by mail, while 43 were sent later by E-mail at the request of interested parties, or to save time. The return rate of completed or partially completed questionnaires was 24 percent (53 respondents), which is reasonable for a mail-based survey of this type (Dillman, 2000). Thirty-one out of the initial 177 practitioners chose to participate by completing or partially completing the questionnaire. Of the 42 practitioners who were recommended or had the questionnaire passed on to them, 19 participated. And finally, 3 questionnaires returned were anonymous[21], for a total of 53 returned questionnaires.

[21] Three surveys were returned with no name or return address attached, therefore no follow-up contact was possible. It was possible, however, to identify their affiliated group (i.e. industry, government, etc.).

Within the questionnaire, participants identified themselves as being a proponent, federal or provincial authority, member of a review panel, consultant, member of a special interest group, non-direct academic or having personal or professional interest, and/or have been involved with northern EA in some other way[22] (Figure 3.3). Of these participants, over fifty percent of the total classified themselves as being a 'federal', 'provincial' or 'territorial authority'. Ten participants were consultants and four were proponents. The 'other' category included three individuals identified as non-direct academics or having a personal or professional interest, four members of a special interest group and one review panellist. Four of the 'others' also had affiliation with First Nations or Aboriginal groups including representation from the Athabasca Tribal Council, Council of Yukon First Nations, LIA, IEMA and the Canadian Arctic Resources Committee (CARC). In addition, five of the participants from the 'federal', 'provincial' and 'territorial authority' groups represented Aboriginal groups, including: Health Canada's Safe Environments Programme; INAC; Centre for Indigenous Environmental Resources; and NIRB. The majority (70 percent) of the respondents had over 15 years of experience in EA practice. Further, several are well known both nationally and internationally for their work in HIA. All respondents have been involved with northern EA practice in some capacity, such as preparing and/or reviewing project EISs.

Because participants were purposefully identified or recommended by others as having relevant experience with northern EA practice, the final composition of the questionnaire participants happened by chance. As a result, the composition is sufficient in that it represents participant's experiences with the state-of-EA practice in the North. It is important to note, however, that the results could be biased towards federal or provincial authority's experiences with EA due to the large representation (50 percent of participants). The classification at this stage, however, is somewhat 'artificial' as the data may or may not reveal differences between groups.

[22] When no primary role was indicated, the participant's affiliation was categorized based on the title of his/her current position.

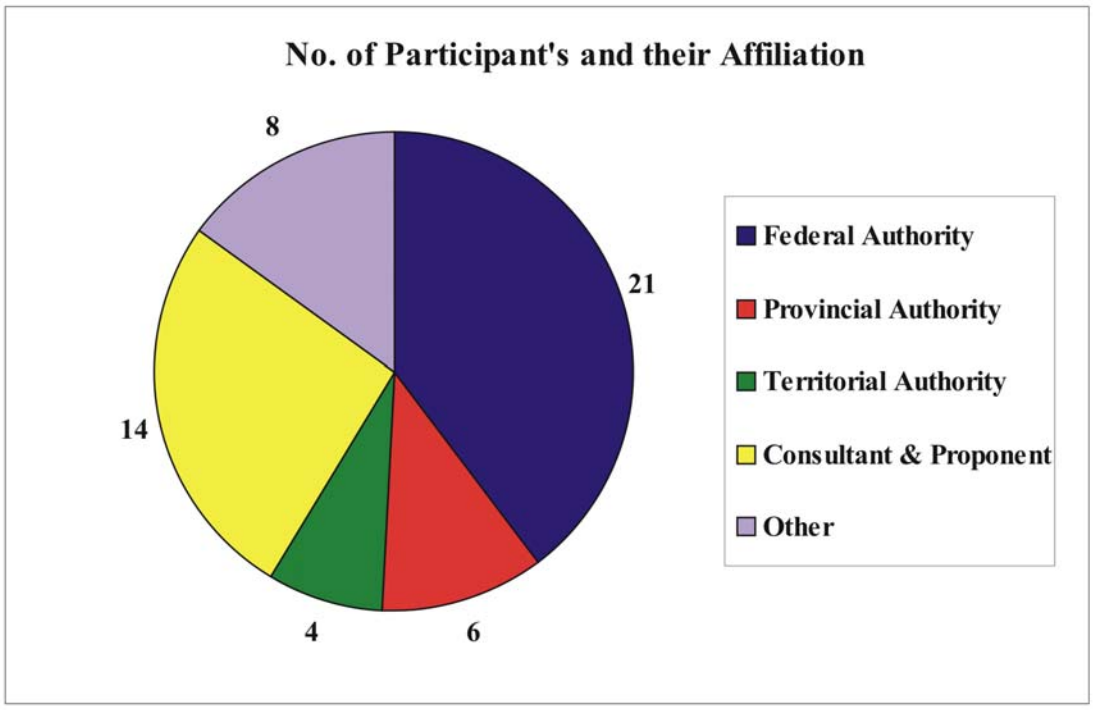

Figure 3.3 Participant's affiliation

3.2.1.3 Questionnaire Design

Data were collected by means of a questionnaire survey containing 31 questions. Four themes shaped the questionnaire, namely EA components, EA methods, determinants of health, and barriers to effective integration. The questions were developed based on a review of the literature on health and EA (specifically, McCarthy *et al*., 2002; Canadian Federal/ Provincial/Territorial Committee on Environmental and Occupational Health, 1999; BMA, 1998; Davies and Sadlar, 1997; CEAA, 1992) as well as literature on EA in the North (Bone, 2003; Kwiatkowski and Ooi, 2003; Mulvihill and Baker, 2001; O'Neil and Solway, 1990; Reed, 1990), and review of select EISs and EAs of northern development projects in the mining and energy resource sector.

The questionnaire comprised five data collection techniques, namely: Likert scales; ratings; paired comparison scales; and quantitative and qualitative responses. The majority of these were Likert type questions based on a scale from "not important" to "extremely important" or "0% of the time" to "100% of the time". Tables 3.3 and 3.4 provide examples of these types of questions, where the participant was asked to check the appropriate box for each EA component. The seven point Likert scale was used

based on Miller's (1956) observation that an individual can simultaneously compare only seven plus or minus two items at any one time.

Table 3.3. Example of a 7 point Likert scale question used in the questionnaire

EA Component	Not important	slightly important	somewhat important	moderately important	Important	very important	extremely important
project description							
Baseline description							
identification of VECs							
impact prediction							
determination of impact significance							
design of impact mgmt measures							
post-project follow-up & monitoring							
impact benefit agreements							

Table 3.4. Example of a 7 point Likert scale question used in the questionnaire

EA Component	0% of cases	1 – 19% of cases	20 – 39% of cases	40 – 59% of cases	60 – 79% of cases	80 – 99% of cases	100% of cases
Project description							
Baseline description							
identification of VECs							
impact prediction							
determination of impact significance							
design of impact management measures							
post-project follow-up and monitoring							
impact benefit agreements							

For example, in comparing the importance of health inclusion in EA practices for development projects in the 'south' to the 'north', participants were asked to indicate on a scale whether they felt it was 'more', 'equally', or 'less important' to consider human health impacts for northern development projects versus southern development projects (Table 3.5).

Table 3.5. Example of a 'paired comparison' question used in the questionnaire

		More important				
More important →	☐ slightly	☐ somewhat	☐ moderately	☐ more important	☐ strongly	☐ extremely
Equally important →	☐					
		Less important				
Less important →	☐ slightly	☐ somewhat	☐ moderately	☐ less important	☐ strongly	☐ extremely

Other questions asked participants to *rate* such variables as 'the performance of northern EA in terms of addressing the impacts of developments on human health,' 'the usefulness of specific EA methods/techniques,' and the 'significance of potential barriers to effective integration' (Table 3.6). In such cases, participants are asked first to review the question or items presented, add any additional items or observations that they consider important, and then to provide a rating of the factors presented based on a scale from: 1 (not significant); 3 (somewhat significant); 5 (significant); 7 (extremely significant); 2, 4, 6 (intermediate ratings). The inclusion of 'other' within several close-ended questions guarantees that all possible alternatives are considered (for example: all perceived barriers to the effective integration of human health in northern EA practice, if any, are considered), thus exhausting all possibilities (Dillman, 2000).

Table 3.6. Example of a 'rating' question used in the questionnaire

BARRIERS	**RATING**
Incomplete understanding of the scope of health in EA	
Absence of standardized procedures of assessing human health impacts in EA	
Lack of communication and coordination between EA practitioners and health professionals	
Difficulty obtaining health data	
Legislation too restrictive or insufficient	
Economic barriers (i.e. lack of funding)	
Temporal barriers (i.e. lack of time)	
Other:	

3.2.2 Semi-structured Interviews

The questionnaire was combined with semi-structured interviews with health professionals and experts (for example, professionals from: Health Canada; Environmental and Occupational Health; and Regional Health Boards) to ascertain, from a health professional's standpoint, the ways in which 'health' are or should be considered within the EA process. Open-ended questions were used to elicit views and opinions from these participants based on their experiences with health issues and northern development. Interviews are a particularly useful technique in this type of research for two main reasons. First, they can assist in filling a gap in knowledge which other methods, such as the questionnaire, are unable to bridge effectively. Second, through interviews, researchers are able to collect a diversity of opinions and experiences (Dunn, 2000). This research thus, used a combination of face-to-face and telephone interviews, as well as E-mail correspondences to enable individuals located in remote northern or far off regions to participate. Using interview modes – such as telephone interviews and sending interview questions by E-mail[23], in place of the more traditional face-to-face interviews has been the topic of several empirical investigations (see, for example, Rubin and Rubin, 1995; Fontana and Frey, 1994; and Harvey, 1988). While telephone interviews should only be used for short structured interviews, they are just as effective. Sturges and Hanrahan (2004) for example, conclude that no significant differences exist between telephone interviews and face-to-face interviews.

Conducting 'virtual interviews' or interviews using such methods as E-mail, allows interviewers to reach people wherever they are in the world at very low cost (USUS, 2004). Sending interview questions by E-mail also enables the interviewee more time to reflect upon the questions and formulate detailed answers. However, two potential shortcomings exist for choosing such a technique. First, time delays may exist between when the E-mail is sent and the time it is opened and answered. This was overcome with telephone contact with potential participants, enabling them to have questions answered and agree to a certain timeline. Second, conducting face-to-face interviews enables the researcher to read and react to interviewee's body language, not

[23] Sending interview questions by E-mail differs from a traditional a traditional interview in that there is limited interaction between the researcher and the interviewee. Therefore, this type of correspondence closely resembles a questionnaire survey methodology.

possible through E-mail correspondence. Sturges and Hanrahan (2004) for example, found that interviews not conducted face-to-face may limit the options of the interviewer to comfort respondents who become emotional during the interview. The ability to read body language is not applicable to the current research.

3.2.2.1 Interview Sampling Methodology

Interview participants were selected by making an initial contact with a few key informants identified in the EA and health literature, who, in turn, identified other potential 'key informants' with experience in health and EA in the North (Bryman, 2001). The initial contacts were identified from the Canadian Environmental Assessment Research Council's (CEARC's) interdisciplinary workshops (1990) and updated from there. The purpose of the semi-structured interviews was to gather qualitative data to complement the data collected from the mail-based questionnaire and provide insight from a health practitioner and researcher perspective.

All potential interview participants were sent the 'interview package' containing an invitation to participate, research summary, consent form, as well as the interview questions. Providing the participants with the interview questions beforehand allowed more time for the respondents to provide detailed answers. Where face-to-face interviews were not possible, telephone interviews were conducted, supplemented with follow-up E-mail-based correspondences for clarification of any outstanding issues (Lounsbury and Aldrich, 1979). Adopting such an approach allows the respondents the opportunity to have questions clarified by the interviewer and are therefore able to provide more informed responses. Creswell (2003) goes further, suggesting that conducting semi-structured interviews is useful when participants cannot be observed directly and they allow the researcher 'control' over the line of questioning. Therefore, selecting a range of health professionals involved in development and northern health issues in addition to the survey of EA practitioners and regulators provide a more comprehensive view of the state-of-practice of health in EA.

Where an individual was not available for a telephone or face to face interview, the interview questions were sent by E-mail. E-mail correspondences were beneficial as the questions could be answered initially at the convenience of the interviewee.

Interviews conducted in person were held at a public place or their place of business. Interviews in person and over the telephone were scheduled based on participant's availability. All interviews conducted over the telephone were scheduled such that the researcher would place the call at the designated time agreed upon by both parties.

All interviews were recorded through note-taking and transcribed immediately following each session (Dunn, 2000). It was also necessary to carry out additional observations to identify aspects that emerged pertaining to particular practices or case studies. For example, interviewees were asked to provide case study examples of projects that did a particularly 'good' or 'poor' job of integrating human health effects in EA. Finally, a letter was sent by E-mail to all interviewees thanking them for their participation. This type of methodology has proven to be an effective choice when time or resources are limited (see for example Davies and Sadler, 1997).

It was clear, for both the questionnaire and interview, that a sufficient number of practitioners and health professionals had been contacted for two reasons. First, the names of potential participants started to repeat, and second, within the interviews, the ideas and/or comments started to repeat.

3.2.2.2 Interview Participation Rate and Composition

In total, 44 health professionals and experts were contacted by E-mail and followed up with a telephone call. The majority of the potential participants (66 percent) was affiliated with 'territorial/regional health authorities' or had an academic interest (grouped under 'other'). Other participant's were comprised of 'federal' and 'provincial health authorities' and consultants (Figure 3.4).

Thirteen semi-structured interviews were conducted. Five interviews were conducted over the telephone, six interviewees requested to receive the questions in advance and respond by E-mail, or regular mail, and two interviews were conducted in person. Interview participants were comprised of 46 percent 'territorial/regional health authorities', 31 percent 'others' with background or experience in health and EA with regard to northern development, 15 percent classified as 'federal health authorities' and eight percent 'provincial health authorities' (Figure 3.5). The low response rate may be limited due to small number of health professionals with experience with EA in the North. In addition to exploring the importance of incorporating health in northern EA

practice, participants were asked how well health is being incorporated in northern EA practice, therefore, some knowledge of recent EA practice was required. Again, the number of participants need not be exhaustive, as statistical representation or extrapolation is not the objective.

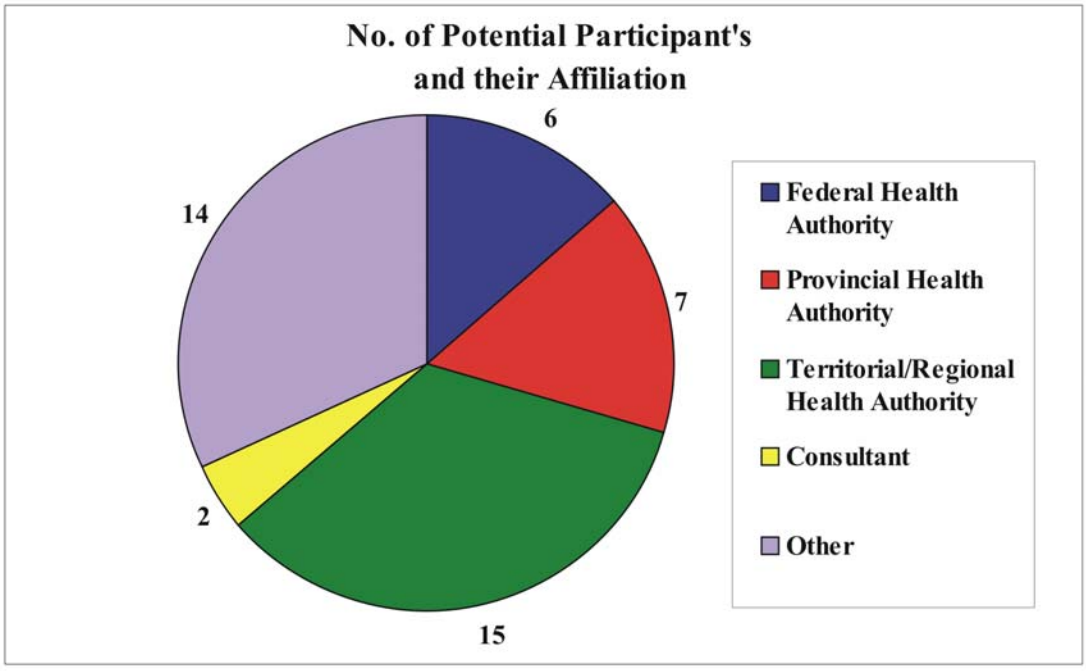

Figure 3.4. Potential interview participant's affiliation

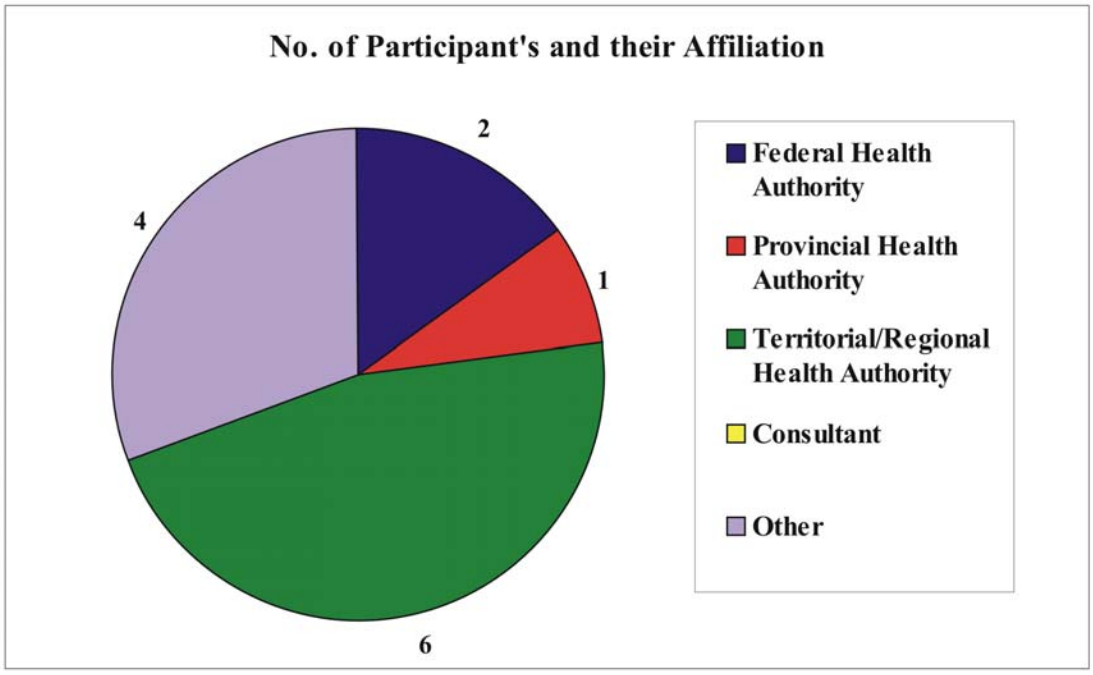

Figure 3.5. Interview participant's affiliation

3.2.2.3 Interview Design

The information obtained from the interviews pertains to:

- whether human health should be included within EA;
- the differences, if any, between northern and non-northern regions with regard to the incorporation of human health issues in EA practices;
- perceived performance of health integration in northern EA practice; and,
- any barriers to effective integration.

The interview format includes open-ended, but directed questions in order to capture the full range of responses. The data obtained in the interviews are secondary and primarily serves to complement, explain, and facilitate the interpretation of the questionnaire data. Refer to Appendix B for an interview template.

3.3 Data Analysis

Both qualitative and quantitative analyses were used to examine the data. Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) and alternative exploratory techniques (e.g. scaling and graphical analyses) to search for patterns in questionnaire responses (e.g. natural groupings by question or participant classification); these are detailed in the following Chapter. The qualitative responses in both the questionnaire survey and interviews were analyzed through content analysis[24].

Several statistical techniques were used to explore the data for particular patterns and trends, including the 95 percent confidence interval for the median, boxplots, Cosine Theta (costheta), and hierarchical cluster analysis. The 95 percent confidence interval for the median is a distribution free statistic. It is derived as follows: Upper and lower fence = median ± (1.58 x (H-spread) / √n). Where the H-spread is the difference between Tukey's upper and lower hinges, represented by the box and whisker plot, and gives the range covered by the middle half of the data (approximately the 25th and 75th percentile) (Noble, 2004a; Velleman and Hoaglin, 1981). The median is the middle of a distribution, for example, half the scores are

[24] Content analysis is a suitable analytical approach to categorize important features, themes or characteristics in text (Bryman, 2001 as cited in Bruekner, 2004).

above the median and half are below the median. The median is less sensitive to extreme scores than the mean, which makes it a better measure for highly skewed distributions[25].

Boxplots provide a simple graphical summary of a set of data. It shows a measure of central location (the median), two measures of dispersion (the range and inter-quartile range), the skewness (from the orientation of the median relative to the quartiles) and potential outliers (marked individually) (Devore and Peck, 1990). Boxplots are therefore especially useful when comparing two or more sets of data.

When comparing across groups however, if the distributions are different, the median is not necessarily the best measure for comparison. Alternatively, the costheta measure of proportionate similarity is a useful method to determine the amount of agreement within the aggregate group, and is derived as follows:

$$\textbf{Cosine } \theta_{(ij)} = \left(\sum_k x_{ik} x_{jk} \right) / \left(\sqrt{\sum_k x^2_{ik} \sum_k x^2_{jk}} \right) \qquad (3.1)$$

x_{jk} = score of panellist i in cell k
x_{jk} = score of panellist j in cell k.

A key advantage of the costheta function is that it is sensitive to the relative proportions of the variables, similar to the 'index of dissimilarity', between distributions but is not dependent on the scaling of the variables. The data for the costheta function are not standardized such that the test statistic is sensitive to different sample sizes (Middleton, 2000). In costheta, standardizing implies that the sample sizes and proportions are the same (therefore not sensitive to different proportions). The costheta function is a strong alternative to more conventional statistical methods for measuring consensus, such as the Chi-square statistic, in that the costheta function is not sensitive to sparse cells and does not require data that are probabilistically sampled (Noble, 2004b; Middleton, 2000). The costheta function provides a more detailed description of groups based on their actual scores and similarity. Whereas a finding of no difference at the 95 percent confidence interval for the median, for example, refers only to the probability of error and not to the proportion of similarity.

Hierarchical cluster analysis is another statistic for finding relatively homogeneous clusters of cases based on measured characteristics. It starts with each

[25] See http://www.ruf.rice.edu/~lane/stat_sim/descriptive/.

case in a separate cluster and then combines the clusters sequentially, reducing the number of clusters at each step until only one cluster is left (Ebdon, 1999). Those that cluster 'farthest to the right', are those that are 'most different' from the group and are likely those causing the skewness in the boxplot. Hierarchical cluster analysis, in the form of dendrograms, is therefore a useful way to find 'natural groupings' within the dataset and identify individual respondents and their affiliations. All of the above techniques are exploratory statistics with a purpose of simply exploring the data for particular patterns and trends and are well suited to complement qualitative analysis.

Results are grouped by theme as outlined in the questionnaire survey. Four themes thus shape the data, notably EA components, EA methods, determinants of health, and barriers to effective integration. The themes will assist in organizing the data and in extracting patterns and themes as per the research objectives. Interview results were used to supplement or explore certain responses or patterns emerging from the survey questions. The interview questions, while open ended, were structured around the major themes as highlighted above.

3.4 Summary

Primary data collected from a questionnaire survey, combined with semi-structured interviews, form the basis of this thesis. This mixed methods approach maximizes the strengths and minimizes the weaknesses associated with using a single method approach. Using a combination of methods frequently yields greater insight than using either one in isolation. Though the quantitative results are dependent on the participant's knowledge of, and experience with, EA and health, participants were selected such that a sufficient range of experiences and perspectives were acquired. In addition, qualitative data collected from the semi-structured interviews complements the quantitative data and provides insight from a health practitioner perspective. Combining qualitative and quantitative research methods can therefore answer the research questions designed for this thesis and provides the opportunity for presenting the diversity of EA practitioner's and health professional's experience with integrating human health into EA practices for northern resource development projects.

CHAPTER 4
RESULTS AND DISCUSSION

4.0 INTRODUCTION

This chapter discusses the results of the mail-out questionnaire survey in conjunction with the qualitative responses from semi-structured interviews. Following a brief discussion of the characteristics of the research participants, results are presented in three sections based on research themes, namely: i) current practice of health assessment in EA; ii) integration and consideration of health determinants; and iii) challenges to effective integration.

4.1 Participant Perspectives and Experience

The questionnaire was specifically targeted at EA practitioners and administrators with experience in the North. Research participants had varied backgrounds and experiences with EA in Canada. Approximately 72 percent (n=46)[26] reported involvement in some capacity with more than 10 EAs in southern regions, and 40 percent (n=50) reported involvement with more than 10 EAs in northern regions. Across all participants, the median number of EAs reported is 12; this includes 20 for southern and 10 for northern regions, respectively. This difference may be due in part to the larger number of EAs conducted in the South relative to the North (Mulvihill, 1990). The group reporting the most EA experience is 'provincial authorities', followed by 'federal authorities', 'territorial authorities', 'consultants and proponents' and 'others', for both southern and northern regions (Table 4.1).

All participants identified health integration in EA as 'important', with 24 individuals (45 percent) suggesting that health integration in EA is 'extremely important'. This confirms findings of recent literature (e.g. Burdge, 2002; Kemm, 2000; Joffe and Sutcliffe, 1997) in that the importance of protecting human health

[26] This number refers to the number of participants who responded to a particular question in the questionnaire.

through project assessment is not a matter of debate. In addition, health professionals with
experience in the North strongly support the integration of health in project-level EA, as illustrated in the following two quotes:

> There is a close interrelationship between developmental environmental impact and human health (Yellowknife Health and Social Services per. Comm., 2004a[27]).

> Human health issues should definitely be part of any development project because of the potential impacts. I see it a lot. Development projects can change a community quite a bit (Yellowknife Health and Social Services per. Comm., 2004b).

Notwithstanding the recognized need to incorporate health in EA, how often human health impacts are *actually* addressed in northern EA practice is certainly the best indicator as to the current state-of-EA practice.

Table 4.1. Participant's EA experience in both southern and northern environments

PARTICIPANTS	***EA EXPERIENCE IN THE SOUTH*** ***(# OF EAS)*** (median values)	***EA EXPERIENCE IN THE NORTH*** ***(# OF EAS)*** (median values)
Federal Authorities	45 (n=21)	17.5 (n=21)
Provincial Authorities	50 (n=5)	30 (n=5)
Territorial Authorities	10 (n=3)	7.5 (n=4)
Consultants and Proponents	10 (n=14)	5 (n=14)
Others	8.5 (n=8)	3.5 (n=8)

4.2 Current Practice of Health Assessment in Northern EA

Generally, 'best'-practice[28] EA is a process through which all potential impacts are assessed (environmental, economic and social), including human health effects, in advance of project development (Boyd, 2003; Baxter *et al*., 2001). An international study of the effectiveness of EA (Sadler, 1996) however, revealed that in practice the

[27] The notation 2004a, 2004b, etc. represents different interviewees from Yellowknife Health and Social Services.

[28] 'Best'-practice is a subjective and dynamic concept and varies from one context to another. Here, best-practice simply refers to the best way of undergoing EA to encompass those practices which can be considered state-of-the-art in terms of their contribution to health impact management and understanding of the health effects of development actions.

consideration of social and health impacts seems to be lacking or not given adequate treatment in project-level EA. Burdge (2002), in a commentary on the state of SIA, agrees, suggesting that EA often fails to address the impacts of project development on human communities and culture.

This contention is supported by interview and questionnaire results. For example, qualitative responses from interviewees indicate that, from a health professional standpoint, EA practitioners are not incorporating health considerations consistently in northern EA practice. An interviewee from Health and Social Services in the North contended that:

> Human health issues are not being incorporated very well. There is no evidence of that, not from an Aboriginal worldview or a health stand point (Yellowknife Health and Social Services per. Comm., 2004b).

Another interviewee suggested:

> The impact of development on health is often overlooked through the EA process, especially north of 60° (Inuvik Regional Health and Social Services Authority per. Comm., 2004).

Also, there is a perception that proponents are doing a better job with health inclusion in their environmental mandate, but in practice human health impacts are not being assessed. One individual from Health and Social Services in the North explained:

> There is a perception that companies are doing a better job of including health issues, but how well is unclear. It seems as though it may just be lip service and the focus remains on environmental factors (Yellowknife Health and Social Services per. Comm., 2004c).

Similar results are evident from the EA practitioner questionnaire. For example, participants were asked to rate on a 7-point Likert Scale 'how often' human health impacts are addressed in EA. Results indicate that 18 participants (37 percent) suggested that human health impacts are addressed 'more than 75 percent of the time' for northern development project assessments and 14 participants (36 percent) said the same for southern developments. Furthermore, the median response indicates that human health is included in EAs 70 percent of the time for northern developments

compared to only 50 percent of the time in southern environments (Table 4.2). These findings are depicted in Figure 4.1, which illustrates, based on the questionnaire results, that human health is being incorporated into northern EA practice more often than for southern EA practice.

Table 4.2. Percentage of time human health impacts are addressed in EA

CURRENT PRACTICE	NORTH		SOUTH	
	median	*95% CI*[a]	*median*	*95% CI*[a]
ALL PARTICIPANTS[b] (North: n=49; South: n=39)	**70**	**64.89 – 85.11**	**50**	**37.36 – 62.64**
Federal Authorities (North: n=20; South: n=18)	65	50.1 – 79.9	45	24.51 – 65.49
Provincial Authorities (North: n=5; South: n=4)	60	34.45 – 100.0	57.5	12.07 – 100.0
Territorial Authorities (North: n=4; South: n=3)	50	29.63 – 70.37	25	0.00 – 56.97
Consultants & Proponents (North: n=13; South: n=11)	80	68.01 – 86.99	70	55.0 – 100.0
Others (North: n=7; South: n=4)	65	23.8 – 71.2	67.5	41.82 – 93.18

[a] The 95% confidence interval for the median is a distribution free statistic and is derived as follows: Upper and lower fence = median ± (1.58 x (H-spread) / √n). Where the H-spread is the difference between Tukey's upper and lower hinges, represented by the box and whisker plot, and gives the range covered by the middle half of the data (approximately the 25th and 75th percentile) (Noble, 2004a; Velleman and Hoaglin, 1981).

[b] 'All participants' refers to the questionnaire survey participants only, and does not include interview participants.

The increased occurrence of human health integration in northern EA practice suggests that human health inclusion in EA is more important in the North. For example, an interviewee from Health Canada, with regard to human health inclusion in northern EA practice, stated:

> It is becoming more important. Humans are a part of the environment and people are tied to the land, especially in the North (Health Canada per. Comm., 2004a).

Another goes further suggesting:

> It is particularly important in the North where human health impacts can be felt much harder on residents not exposed to widespread development (Indian and Northern Affairs Canada, per. Comm., 2004).

In addition, the two data sets (health inclusion in EA for northern versus southern developments) are statistically different. Table 4.2 illustrates this difference at the 95 percent confidence interval for the median, which shows a range of 64.87 to 85.13 for northern developments and 37.34 to 62.66 for southern developments across all participants. The intervals for the medians do not overlap, therefore it can be said at the 95 percent confidence interval level that there is a difference between the integration of health in northern versus southern EA practice.

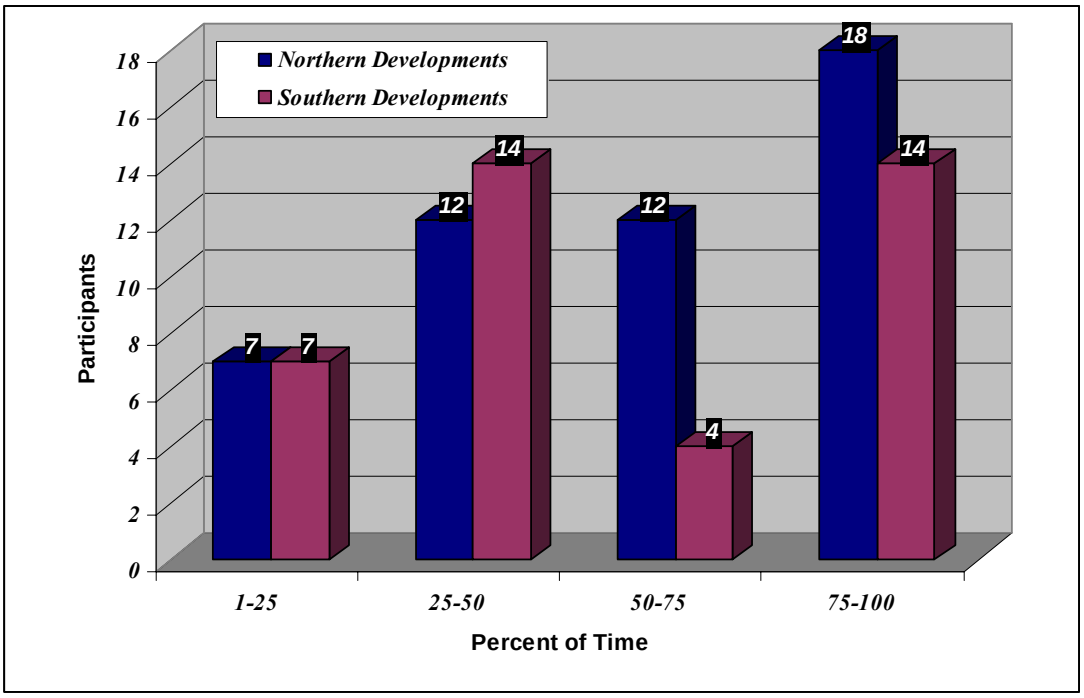

Figure 4.1. Human health inclusion in EA: North versus South

To further investigate these differences, EA practitioners and administrators were asked to compare the importance of human health inclusion in EA practice for northern regions to that of southern regions. In response, over 50 percent (n=51) identified human health inclusion in EA as 'equally important' in northern and non-northern environments and therefore not dependent on geographic location. One Senior Environmental Advisor, for example, contended human health impacts should be assessed in "all areas we propose projects" (Petro Canada per. Comm., 2004), while another individual from Public Works and Government Services Canada (PWGSC) suggested: "health is always important" (PWGSC per. Comm., 2004). That said, 47

percent (n=51) believed health inclusion is *more* important in the North than in southern environments (Table 4.3). An interviewee from Health Canada, for example, argued that the North is more sensitive to development projects than southern environments and stated:

> The impact of projects is much greater in the north. The influx of money into northern areas brings social problems such as alcoholism, violence, radical change to traditional ways. Most …impact assessments do not look at these issues, yet they could have the most significant impact on the individuals in these areas (Health Canada per. Comm., 2004b).

O'Neil and Solway (1990) agree, suggesting that human health is a state of balance and harmony between human beings and their environment, a concept embedded in Aboriginal cultures.

Table 4.3. Importance of human health inclusion for development projects in the North compared to the South

All Questionnaire Participants (n=51)	**IMPORTANCE**		
	More	***Equally***	***Less***
No. of Participants	24 (47%)	26 (51%)	1 (2%)

Not only are human health effects incorporated more often in northern EA practice, quantitative responses from 'territorial authorities' and 'consultants and proponents' suggested that northern EA's performance is 'above average' in terms of addressing the impacts of development on human health, such that physical health impacts and health risks are treated as important as other potential impacts (Table 4.4). This is arguably a direct result of the recent adoption of the MVRMA, YESAA, and the NLCA which have resulted in significant improvements in recent years with regard to incorporating community health and public concerns in northern EA practice (MVEIRB, 2002).

Though 'territorial authorities' perceived northern EA performance to be 'above average', they also believed there is room for improvement. For example, one member of the MVEIRB contended:

> The MVRMA requires culture, social and economic factors be considered (along with environmental) - and these issues are now addressed in the Mackenzie Valley by the MVEIRB. However, there is always room for improvement on all levels (MVEIRB Member per. Comm., 2004).

The 'others' group believed northern EA performance to be 'below average', such that only specific physical health impacts are addressed (e.g. disease) (Table 4.4). The differences of opinion may be due in part to the amount of northern EA experience of each group (Table 4.1). For example, 'provincial authorities' have the most experience with a median number of 30 EAs in the North, while 'federal authorities' only have a median number of 17.5 EAs in the North. 'Provincial authorities' rated EA performance as 'very good' and 'federal authorities' only 'average'.

Table 4.4. Performance of northern EA in terms of addressing the impacts of development on human health

CURRENT PRACTICE	**NORTHERN EA PERFORMANCE** *median*[a]	*95% CI*
ALL PARTICIPANTS (n=51)	**Above Average**	4.56 – 5.44
Federal Authorities (n=21)	Average	3.65 – 4.35
Provincial Authorities (n=6)	Very Good	3.55 – 7.00
Territorial Authorities (n=4)	Above Average	3.42 – 6.58
Consultants & Proponents (n=13)	Above Average	3.68 – 6.32
Others (n=7)	Below Average	1.81 – 4.19

[a] In terms of addressing the impacts of development on human health, EA practitioners and administrators assigned ratings based on the following definitions:

1= Very poor: health issues are not addressed in EA practice.
2 = Poor: health issues are given superficial and summary treatment, but impacts are not assessed.
3 = Below average. Only specific physical health impacts are addressed.
4 = Average. Physical health impacts and health risks are assessed.
5 = Above average. Physical health impacts and risks are treated as important as other potential impacts.
6 = Very good. Health is broadly defined to include biophysical health as well as social health impacts.
7 = Excellent. Physical and social health impacts are thoroughly and completely addressed.

Perhaps a difference in world views is another important factor to consider. Bone (2004), for example, argued that the North is perceived as either a frontier or as a homeland. This perspective is also expressed in Berger's (1977) report on the Mackenzie Valley Pipeline Inquiry – *Northern Frontier, Northern Homeland*. The frontier theme coincides with natural resource development, to be exploited by people not from the North, while the homeland theme coincides with areas dominated by

Aboriginal peoples. The Aboriginal worldview is one which sees the people, the elements, the plants and the animals as interconnected, on the physical and spiritual planes (Health Canada, 1999).

Moreover, Aboriginal attachment to the land goes far beyond any individualized concept of ownership. The participants grouped under the title 'others' are comprised of individuals with special interest in the North, including members of review panels, special interest groups, academics, as well as representation from Aboriginal groups. Based on their experience, this group does not believe human health inclusion in northern EA practice to be sufficient (Table 4.4). For example, one member of the 'others' group with substantial experience in the North argued:

> The task of determining significance is *ad hoc*[29] and poorly done. Not only for human health but all impacts (Canadian Arctic Resources Committee per. Comm., 2004).

This contention is supported by interviews with health professionals. For example, an interviewee from Health and Social Services in the North suggested:

> I see no evidence that human health issues are being incorporated very well into EA practices in the North. They do not take on an Aboriginal worldview which is important to the health of the people of the North, or a health standpoint (Yellowknife Health and Social Services Authority per. Comm., 2004b).

These findings illustrate a prevailing recognition of the importance of, and the need for, human health inclusion in northern EA practice. A closer examination of the individual steps in project-level EA follows, with specific attention on the state of human health inclusion.

4.2.1 Health Integration and the EA Process

Since the Berger Inquiry of 1977, which set a precedent for the integration of human health in EA practice (see section 1.2), there has been some forward movement by way of the adoption of several pieces of federal and provincial legislation which require the consideration of project impacts on human health (Table 2.2) (Canadian Federal/ Provincial/Territorial Committee on Environmental and Occupational Health, 1996). In addition, the adoption of the World Health Organization's definition of

[29] The term *ad hoc* is widely used in EA literature to describe relatively unstructured and often intuitive impact assessment programs (Meredith, 1995).

health, which goes beyond merely the absence of disease or infirmity to include the physical, mental, and social well-being of humans, has provided the basis of human health inclusion in EA practice. It is ultimately left up to the individual practitioner to decide the extent to which health is included within EA on a project by project basis; however, in the North, as well as the rest of Canada, the majority of projects lie outside the health sector and do not usually include health as an explicit objective (Birley, 2002).

As discussed in section 2.1, project-level EA consists of a number of systematic steps including: scoping; impact prediction; impact mitigation; and post-project follow-up (Figure 4.2). It has been suggested by Davies and Sadler (1997), among others, that through these steps, EA can help to minimize or even eliminate the adverse health effects associated with development. These five steps can be further broken down into a number of smaller components, namely: 'project description'; 'baseline description'; 'identification of valued ecosystem components (VECs)'; 'impact prediction'; 'determination of impact significance'; 'design of impact management measures'; 'post-project follow-up and monitoring'; and finally, 'impact benefit agreements (IBAs)'. To assess the current state-of-EA practice, questionnaire participants were asked 'how often', in northern EA practice, 'human health' or 'human health impacts' are incorporated into each of the EA components and the 'importance' of doing so.

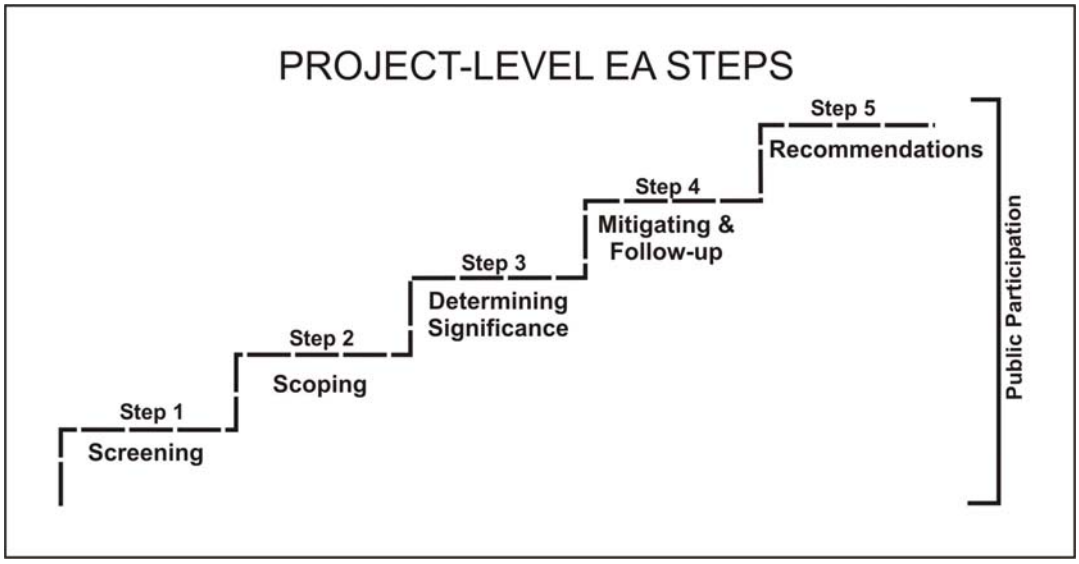

Figure 4.2. Common procedural elements of EA
Source: Modified from the Canadian Handbook on HIA: The Basics, 1999

The results confirm the literature (Birley, 2002; Davies and Sadler, 1997), which contends that health is included on an *ad hoc* basis with little consistency in approaches and procedures. Health is being integrated more often in the 'pre-decision' analysis than it is in the 'post-decision' stages. For example, responses from questionnaire surveys and interviewees revealed that human health impacts are being incorporated between '40 and 59 percent of all cases', on average, during 'impact prediction' (pre-decision) and only '1 to 19 percent of all cases' during 'post-project follow-up and monitoring' (post-decision) (Table 4.5).

Table 4.5. Frequency of health integration versus importance

EA COMPONENT	***A) FREQUENCY OF HEALTH INTEGRATION***		***B) IMPORTANCE OF HEALTH INTEGRATION***	
	% of all cases[a]	***95% CI***	***Importance***[b]	***95% CI***
Project description	1-19%	1.51-2.49	Important	4.32-5.68
Baseline description	20-39%	2.27-3.73	Important	4.54-5.46
Identification of VECs	20-39%	2.27-3.73	Very Important	4.77-5.23
Impact prediction	**40-59%**	3.27-4.73	Very Important	5.54-6.46
Determination of impact significance	40-59%	3.27-4.73	Very Important	5.54-6.46
Design of impact management measures	20-39%	2.27-3.73	Very Important	5.54-6.46
Post-project follow-up and monitoring	**1-19%**	1.51-2.49	Very Important	5.77-6.23
Impact benefit Agreements	20-39%	1.77-3.23	Very Important	5.66-6.34

[a] This range represents the median response of participants when asked how often 'human health' or 'human health impacts' are incorporated into each of the EA components in northern EA practice, where: 1 = 0%; 2 = 1-19%; 3 = 20-39%; 4 = 40-59%; 5 = 60-79%; 6 = 80-99%; and 7 = 100%.

[b] The importance level represents the median response of participants when asked how important it is to consider 'human health' or 'human health impacts' in each of the EA components in northern EA practice, where: not important = 1; slightly important = 2; somewhat important = 3; moderately important = 4; important = 5; very important = 6; and extremely important = 7.

Arts *et al*. (2001:177) suggest that though "the 'pre-decision' analysis is necessary… it is not a sufficient condition for sound planning, decision- making and management of projects." The results are therefore significant as it is not the predicted effects that matter, rather it is the real effects that are relevant to the people in the North (Arts *et al*., 2001). In other words, health impacts may be identified, but the *actual* health effects are not known without following-up and monitoring. Furthermore, a discrepancy exists

between the 'frequency' and 'importance' of human health integration in all eight EA components. For example, human health was considered to be incorporated less than 60 percent of the time during all stages of northern EA practice, however its inclusion was rated across all stages to be 'important' to 'very important' (Table 4.5).

Table 4.6 reveals disagreement between groups on the frequency and importance of health integration. Two groups in particular, 'territorial authorities' and 'others', show dissent from the other groups. 'Territorial authorities' for example, assign the highest ratings with regard to importance, rating 'VEC identification'; 'impact prediction'; 'significance determination'; and 'impact management' as 'extremely important'. Similarly, the 'others' group rated two EA components as 'extremely important', namely: 'impact prediction' and 'design of impact management measures'. The confidence intervals for the medians do not indicate a significant difference at the 95 percent level on the frequency of health integration between any EA components. However, this finding refers to the probability of error, not the proportion of similarity, such that the finding does not necessarily mean the EA components are equal (Middleton, 2000).

To further investigate this, a costheta function[30] was used to test the similarity between groups for both the 'frequency' and 'importance' of an EA component in assessing human health impacts in northern EA. The example that follows illustrates the calculations for testing similarity between 'federal authorities' and the 'others' group on the *importance* of health integration during 'follow-up and monitoring' in northern EA practice (Table 4.7). The results show that in terms of their perception of the importance of health integration during 'follow-up and monitoring', 'federal authorities' and the 'others' groups are only 65.8 percent similar. Table 4.8 illustrates the similarities between all five groups for both the frequency and importance of health integration. 'Consultants and proponents' and 'federal authorities' were found to be least similar on the frequency of health integration during 'follow-up and monitoring' at 59.4 percent similar (Table 4.8a). On the importance of health inclusion in 'follow-up and monitoring', 'territorial authorities' and 'federal authorities' were least similar at 60.8 percent (Table 4.8b).

[30] See equation 3.1, section 3.3.

Table 4.6. Frequency of human health integration versus importance in northern EA practice

EA COMPONENT	FEDERAL AUTHORITIES				PROVINCIAL AUTHORITIES				TERRITORIAL AUTHORITIES				CONSULTANTS & PROPONENTS				OTHERS			
	Frequency of health integration		Importance of health integration		Frequency of health Integration		Importance of health integration		Frequency of health Integration		Importance of health integration		Frequency of health Integration		Importance of health integration		Frequency of health Integration		Importance of health integration	
	% of cases[a]	95% CI	Imp.[b]	95% CI	% of Cases	95% CI	Imp.	95% CI	% of cases	95% CI	Imp.	95% CI	% of cases	95% CI	Imp.	95% CI	% of cases	95% CI	Imp.	95% CI
Project description	1 – 19%	1.47 2.53	Imp.	3.73 6.27	1 – 19%	1.61 2.40	Imp.	1.88 6.12	20 – 39%	0.00 6.16	Imp.	2.13 6.87	1 – 19%	0.50 4.50	Imp.	4.12 5.88	1 – 19%	0.08 3.08	Mod. Imp.	2.81 5.19
Baseline description	1 – 19%	1.12 2.88	Imp.	3.91 6.09	1 – 19%	0.81 3.19	Imp.	3.59 6.41	80 – 99%	2.74 7.00	Very Imp.	4.02 7.00	40 – 59%	2.00 5.00	Very Imp.	5.56 6.44	20 – 39%	1.03 4.98	Very Imp.	5.11 6.89
VEC identification	20 – 39%	2.29 3.71	Very Imp.	4.64 5.36	20 – 39%	1.71 3.29	Imp.	2.59 5.41	60 – 79%	2.52 6.48	**Ext. Imp.**	5.32 7.00	60 – 79%	3.00 7.00	Very Imp.	5.56 6.44	1- 19%	1.13 5.87	Very Imp.	5.70 6.30
Impact prediction	20 – 39%	2.29 3.71	Very Imp.	5.28 6.72	40 – 59%	1.03 4.98	Imp.	5.00 5.00	40 – 59%	1.63 6.37	**Ext. Imp.**	6.60 7.00	80 – 99%	4.50 6.50	Very Imp.	5.56 6.44	40 – 59%	0.44 7.00	**Ext. Imp.**	6.40 7.00
Significance determination	20 – 39%	1.94 4.06	Very Imp.	5.28 6.72	40 – 59%	1.02 4.98	Imp.	4.29 5.71	40 – 59%	0.34 6.66	**Ext. Imp.**	5.31 7.00	60 – 79%	3.50 7.00	Very Imp.	5.56 6.44	1 – 19%	0.92 4.08	Very Imp.	5.40 6.60
Impact management	20 – 39%	1.94 4.06	Very Imp.	5.46 6.54	1 – 19%	0.81 3.19	Imp.	5.00 5.00	40 – 59%	0.34 6.66	**Ext. Imp.**	6.60 7.00	60 – 79%	4.00 6.00	Very Imp.	5.56 6.44	1 – 19%	0.42 3.58	Ext. Imp.	5.11 6.89
Follow-up & Monitoring	1 – 19%	1.65 2.35	Very Imp.	5.64 6.36	1 – 19%	0.42 3.58	Imp.	4.29 5.71	20 – 39%	0.92 4.08	Very Imp.	5.60 6.40	40 – 59%	2.00 5.00	Ext. Imp.	6.00 6.00	1 – 19%	1.21 2.79	**Very Imp.**	5.11 6.89
IBAs	20 – 39%	1.44 3.56	Very Imp.	5.09 6.91	1 – 19%	2.00 2.00	Imp.	2.88 7.00	20 – 39%	0.63 5.37	Imp.	2.20 7.00	60 – 79%	3.00 7.00	Very Imp.	6.00 6.00	20 – 39%	0.52 4.48	Very Imp.	5.40 6.60

[a] This range represents the median response of participants when asked how often 'human health' or 'human health impacts' are incorporated into each of the EA components in northern EA practice, where: 1 = 0%; 2 = 1-19%; 3 = 20-39%; 4 = 40-59%; 5 = 60-79%; 6 = 80-99%; and 7 = 100%.

[b] The importance level represents the median response of participants when asked how important it is to consider 'human health' or 'human health impacts' in each of the EA components in northern EA practice, where: 1 = 'not important'; 2 = 'slightly important'; 3 = 'somewhat important'; 4 = 'moderately important'; 5 = 'important'; 6 = 'very important'; and finally 7 = 'extremely important'.

Table 4.7. Testing for similarities between 'federal authorities' and 'others' on the importance of health integration during 'follow-up and monitoring' using the costheta function

FEDERAL AUTHORITIES (Xik)	OTHERS (Xjk)	(Xik)*(Xjk)	Xik^2	Xjk^2
1	7	7	1	49
6	6	36	36	36
6	6	36	36	36
2	5	10	4	25
5	5	25	25	25
6	7	42	36	49
5	5	25	25	25
6	-	6	36	-
6	-	6	36	-
5	-	5	25	-
5	-	5	25	-
4	-	4	16	-
5	-	5	25	-
7	-	7	49	-
5	-	5	25	-
7	-	7	49	-
6	-	6	36	-
7	-	7	49	-
6	-	6	36	-
6	-	6	36	-
6	-	6	36	-
"-" indicates missing value		**$(\sum$ Xik Xjk) = 261**	**$\sum$ = 642**	**$\sum$ = 245**
			$(\sqrt{\sum X^2ik \sum X^2jk}) = (\sqrt{642*245}) = 396.6$	
		$(\sum$ Xik Xjk) / $(\sqrt{\sum X^2ik \sum X^2jk}) = 65.8\%$ similarity		

Table 4.8. Costheta values for a) frequency; and b) importance of health integration during 'follow-up and monitoring' in northern EA

b) / *a)*	***Federal Authorities***	***Provincial Authorities***	***Territorial Authorities***	***Consultants Proponents***	***Others***
Federal Authorities		68.2% Similar	**60.8% Similar**	94.8% Similar	65.8% Similar
Provincial Authorities	73.2% Similar		96.2% Similar	86.1% Similar	92.1% Similar
Territorial Authorities	84.8% Similar	94.9% Similar		78.3% Similar	85.2% Similar
Consultants Proponents	**59.4% Similar**	70.7% Similar	84.5% Similar		85.2% Similar
Others	87.1% Similar	76.5% Similar	90.4% Similar	94.9% Similar	

From the results, the 'territorial authorities' and 'others' seem to be more similar in their perspectives to those of health professionals than EA practitioners and

administrators, in that they seem to have adopted a multidimensional or "holistic" view of health. For example, an Impact Assessment Analyst with Health and Social Services in the NWT contended that human health assessment in northern EA practice:

> Is becoming more recognized as the NWT faces such an increase in development and as traditions by many families are attempted to be maintained. The MVEIRB has been proactive at identifying and acknowledging the significance of human health in EA (Health and Social Services per. Comm., 2004).

To explore the reasons why practice falls short of the 'recognized importance', we must focus attention on the practitioners conducting the EAs. One member of the 'others' group, for example, noted:

> Health is included in the definition of "environment effect". Of course like most other things in the *Act* it is up to the discretion of the responsible authority to what extent health issues are considered (Natural Resource Institute per. Comm., 2004).

That said, it has been suggested in the literature (Birley, 2002), as well as the interview and questionnaire results, that EA practitioners do not have the necessary expertise to effectively integrate human health impacts in EA practice. One interviewee from Environment Canada contended:

> At present, the lead agencies responsible for conducting assessment, both at the federal and provincial levels of government in Canada, …neither have the needed capability nor the capacity to deal adequately with human health related issues and concerns. Qualified health professionals neither play a direct role nor have the needed input regarding human health related matters in conducting assessments in Canada today (Environment Canada per. Comm., 2004a).

He/she goes on to suggest:

> It is the practitioners who have not taken to incorporating it. Health Canada needs to get out there and promote the incorporation of health in EA and take a more active role in federal EA. They are a tiny player right now and they need to be more involved (Environment Canada per. Comm., 2004a).

Furthermore, another questionnaire respondent from Environment Canada suggested human health impact assessment should be part of EA practice; however he/she believed:

> It should be championed by Health Canada, not an experiment for everyone else involved (Environment Canada per. Comm., 2004b).

Banken (1999: S28) agrees, suggesting in order to maximize the effectiveness of EA (including physical, social, and cultural impacts), an iterative process must take place involving interactions between the scientific experts (including the social assessors), the public, the project proponent, and government agencies.

4.2.2 Nature of Health Integration

Health inclusion in northern EA has traditionally been limited to the physical health components that the project directly controls[31], leaving the social and cultural impacts largely unaddressed (Noble and Bronson, 2004; Gibson, 2002). Identifying causal links between project actions, environmental change and human health plague EA practitioners (Eyles, 1999). This is particularly the case in the North.

The Cluff Lake Board of Inquiry, for example, referred to it as a "near impossible task" to measure the social costs of uranium mining operations on an already disordered Northern society (Cluff Lake Board of Inquiry, 1978: 174). In principle, according to an interviewee from one of the regions uranium mining companies, there are often too many confounding factors in northern communities to tell whether there is an effect or not since all communities are too far away for direct effects assessment based on ecological risk and pathways monitoring. An Environmental Science and Assessment Coordinator with the federal government contended:

> Human health effects should be considered as an effect of the project, not as an effect resulting from a change to the environment. This is why health effects are so often ignored in EA (Western Canada Service Centre per. Comm., 2004).

This assertion was confirmed by questionnaire results such that, in practice, more attention is typically given to physical health and health impacts due to physical environmental change than to broader social health impacts in each EA component (Table 4.9a). At the same time, participants (n=48) indicated that, on average, human health *should* be given 'equal emphasis' in each of the EA components in comparison to physical environmental factors (Table 4.9b). Furthermore, a difference was found to exist between the amount of emphasis 'typically given' and the amount that 'should' be given to health in comparison to biophysical factors in each EA component. For example, the confidence interval for the amount of emphasis typically given to human

[31] For example, exposure levels, worker's physical safety, etc.

health integration during 'project description' ranges from 1.51 to 2.49, whereas the amount of emphasis that 'should be' given ranges from 4.0 to 4.0. The two confidence intervals do not overlap; therefore, it can be said at the 95 percent confidence level that there is a difference between what is typical in practice and what should be the case. These findings suggest that in practice, across all stages of EA, health integration is less than sufficient in that health integration is equally important across all stages of EA, but is done equally poor throughout the assessment process.

Table 4.9. Emphasis given to human health integration compared to physical environmental factors: All participants

EA COMPONENT	***A) EMPHASIS 'TYPICALLY' GIVEN***		***B) EMPHASIS THAT 'SHOULD' BE GIVEN***	
	Median[a]	***95% CI***	***Median***	***95% CI***
Project description	Less Emphasis	**1.51 – 2.49**	Equal Emphasis	**4.0 – 4.0**
Baseline description	Less Emphasis	1.76 – 2.24	Equal Emphasis	4.0 – 4.0
Identification of VECs	Less Emphasis	1.76 – 2.24	Equal Emphasis	4.0 – 4.0
Impact prediction	Less Emphasis	1.51 – 2.49	Equal Emphasis	4.0 – 4.0
Determination of impact significance	Less Emphasis	1.51 – 2.49	Equal Emphasis	3.89 – 4.11
Design of impact management measures	Less Emphasis	1.27 – 2.73	Equal Emphasis	3.77 – 4.23
Post-project follow-up and monitoring	Less Emphasis	1.51 – 2.49	Equal Emphasis	4.0 – 4.0
Impact benefit agreements	Less Emphasis	1.27 – 2.73	Equal Emphasis	3.77 – 4.23

[a] The amount of emphasis each northern EA component is typically given as well as the amount that should be given to human health compared to physical environmental factors was rated on a scale from 'extremely less emphasis' = 1, 'less emphasis' = 2, 'slightly less emphasis' = 3, 'equal emphasis' = 4, 'slightly more emphasis' = 5, 'more emphasis' = 6, and finally 'extremely more emphasis' = 7.

However, differences between groups do exist (Table 4.10). For example, 'provincial authorities' suggest that, in practice, the amount of emphasis 'typically' given to human health matches the amount of emphasis that 'should' be given ('equal emphasis') for four EA components, confirmed by the confidence intervals, while all other groups suggest it is being given less emphasis. This may be due to the difference in northern EA experience, as 'provincial authorities' indicated the most experience (Table 4.1). 'Territorial authorities' however, indicate human health inclusion in 'post project

Table 4.10. Emphasis given to human health integration compared to physical environmental factors

EA COMPONENT	FEDERAL AUTHORITIES				PROVINCIAL AUTHORITIES				TERRITORIAL AUTHORITIES				CONSULTANTS & PROPONENTS				OTHERS			
	Emphasis 'typically' given		**Emphasis that 'should' be given**		**Emphasis 'typically' Given**		**Emphasis that 'should' be given**		**Emphasis 'typically' given**		**Emphasis that 'should' be given**		**Emphasis 'typically' given**		**Emphasis that 'should' be given**		**Emphasis 'typically' given**		**Emphasis that 'should' be given**	
	Emp.[a]	95% CI	Emp.	95% CI	Emp.	95% CI	Emp.	95% CI	Emp.	95% CI	Emp.	95% CI	Emp.	95% CI	Emp.	95% CI	Emp.	95% CI	Emp.	95% CI
Project description	Less Emp.	1.47 2.53	Equal Emp.	4.0 4.0	Less Emp.	1.21 2.79	Equal Emp.	4.0 4.0	Less Emp.	1.54 2.46	Equal Emp.	2.63 5.37	Sli. Less	2.05 3.95	Equal Emp.	3.77 4.23	Less Emp.	1.6 2.4	Equal Emp.	3.7 4.3
Baseline description	Less Emp.	0.0 5.0	Equal Emp.	4.0 4.0	Sli. Less	1.3 3.7	Equal Emp.	4.0 4.0	Less Emp.	1.09 2.91	Equal Emp.	4.0 4.0	Less Emp.	1.52 2.48	Equal Emp.	3.77 4.23	Less Emp.	1.6 2.4	Equal Emp.	3.7 4.3
VEC identification	Less Emp.	1.65 2.35	Equal Emp.	4.0 4.0	Sli. Emp.	1.32 3.69	Equal Emp.	4.0 4.0	Less Emp.	1.09 2.91	Equal Emp.	4.0 4.0	Less Emp.	1.29 2.71	Equal Emp.	3.77 4.23	Less Emp.	0.42 3.58	Equal Emp.	3.11 4.89
Impact prediction	Sli. Less	1.62 3.38	Equal Emp.	4.0 4.0	**Equal Emp.**	1.42 4.58	**Equal Emp.**	4.0 4.0	Less Emp.	1.54 2.46	Equal Emp.	4.0 4.0	Less Emp.	1.29 2.71	Equal Emp.	4.0 4.0	Less Emp.	0.82 3.18	Equal Emp.	3.11 4.89
Significance determination	Less Emp.	1.65 2.35	Equal Emp.	4.0 4.0	**Equal Emp.**	1.42 4.58	**Equal Emp.**	4.0 4.0	Less Emp.	1.09 2.91	Equal Emp.	4.0 4.0	Sli. Less	2.05 3.95	Equal Emp.	3.77 4.23	Less Emp.	0.42 3.58	Equal Emp.	3.11 4.89
Impact management	Less Emp.	1.29 2.71	Equal Emp.	3.66 4.34	**Equal Emp.**	1.02 4.98	**Equal Emp.**	4.0 4.0	Sli. Less	1.63 4.37	Equal Emp.	4.0 4.0	Sli. Less	1.63 4.37	Equal Emp.	4.0 4.0	**Ext. Less**	0.00 3.48	**Equal Emp.**	3.11 4.89
Follow-up & Monitoring	Less Emp.	1.29 2.71	Equal Emp.	4.0 4.0	**Equal Emp.**	0.63 5.37	**Equal Emp.**	3.29 4.71	**Ext. Less**	0.09 1.91	**Equal Emp.**	4.0 4.0	Less Emp.	1.29 2.71	Equal Emp.	3.32 4.68	**Ext. Less**	0.32 2.69	**Equal Emp.**	3.11 4.89
IBAs	Less Emp.	1.12 2.88	Equal Emp.	3.66 4.34	Less Emp.	0.42 3.58	Equal Emp.	3.41 5.41	Sli. Less	1.63 4.37	Equal Emp.	3.54 4.46	Equal Emp.	2.33 5.67	Equal Emp.	3.54 4.46	Sli. Less	0.13 4.87	Equal Emp.	3.4 4.6

[a] The amount of emphasis each northern EA component is typically given as well as the amount that should be given to human health compared to physical environmental factors was rated on a scale from 'extremely less emphasis' = 1, 'less emphasis' = 2, 'slightly less emphasis' = 3, 'equal emphasis' = 4, 'slightly more emphasis' = 5, 'more emphasis' = 6, and finally 'extremely more emphasis' = 7.

follow-up and monitoring' is *typically* given 'extremely less emphasis' in comparison to physical environmental factors. The 'others' group agrees, and indicates human health is also *typically* given 'extremely less emphasis' for 'design of impact management measures' in comparison to physical environmental factors, in addition to 'post-project follow-up and monitoring'. All groups agree that human health 'should' be given 'equal emphasis' to physical environmental factors across all EA stages.

It can be concluded from these results that northern EA can and needs to do a better job of assessing health impacts. The two groups with close links to northern health issues and development ('territorial authorities' and 'others') indicate that EA practice falls short of its primary purpose. EA is, after all, a systematic analysis of the potential impacts that a project can have on the environment (including the physical, social, cultural and economic realms) (Munier, 2004). Following-up on the actual impacts the project has on human health, beyond the physical health components, is therefore intrinsic to the EA system.

4.2.3 Predicting health impacts

All EA activities and processes centre on efforts to anticipate the environmental effects of new undertakings and to make better decisions about them (Gibson, 2002). Human health, included under 'environmental effects', is therefore an imbedded responsibility of EA practitioners and administrators. A senior advisor from the CEAA, for example, suggested:

> Human health is directly included into the concept of environment. Especially for First Nations where the environment is one component of 'health' (CEAA per. Comm., 2004).

Predicting health impacts, like all other impacts, is therefore fundamental to EA (Banken, 1999). To do this, there are a number of 'common' EA methods that are used in most assessments (Meredith, 1995), namely professional judgement, comparative case study analyses, interaction matrices, checklists and qualitative risk assessment just to name a few. Often treated synonymously, techniques differ from methods in that techniques provide the necessary data, whereas methods are concerned with the various aspects of assessment, such as the identification and description of likely impacts (Barrow, 1997; Canter, 1996).

Within the context of this research, participants were asked a series of questions with regard to specific methods typically used in northern EA practice to identify, predict and assess human health impacts, and to evaluate their use. The median response was calculated for the percentage of time each of the methods is used in northern EA as well as each method's usefulness *rating* across all participants. The results show contradictory ratings of the usefulness of each method compared to how often they are used (Table 4.11). 'Dialogues with communities,' for example, received the highest ranking of 'extremely useful' but is only used between '60 and 79 percent of the time'. One industry representative commented on the importance and noted:

> Good EA practices are those that encourage dialogue with communities. They will tell you if you are having an impact on health beyond the boundaries of the project … and are not afraid to let the companies know (Uranium mining industry per. Comm., 2004).

In addition, a statistical difference was found to exist between the percentage of time 'dialogues with communities' are used to assess health impacts and the usefulness of doing so. For example, the confidence intervals for the median range from 4.15 to 5.85 for the percentage of time and 6.67 to 7.00 for the usefulness of using 'dialogues with communities' to assess health impacts. The intervals do not overlap; therefore, a difference is said to exist. Furthermore, a statistical difference can be found for the usefulness of 'dialogues with communities' in assessing health impacts to that of all other methods (Table 4.11b). These findings suggest that 'dialogue with communities' is the most important method in northern EA practice to identify, predict or assess health impacts.

HIA is viewed by some to be a progression from risk assessment and environmental epidemiology (World Health Organization, 1999), defined as the study of the environmental causes of health-related states and events in defined populations (Davies, 1992). Epidemiological models are used to predict the effects of chemical and physical agents on selected health outcomes (Kemm, 2001), however, they are often limited to gross health effects such as mortality and cancer, rather than subtle indicators of health (Davies, 1992). Kemm (2001) contends that though the range of outcomes to

which the approach has been applied is limited, there is no reason why it should not be extended to other outcomes, including social well-being.

Table 4.11. Methods used in practice to identify, predict or assess health impacts

METHODS	***A) 'TYPICALLY' USED***		***B) RATING***	
	Median[a]	***95% CI***	***Median***[b]	***95% CI***
Professional Judgement	60 – 79% of the time	4.43 – 5.57	Useful	4.67 – 5.33
Comparative case study analyses	20 – 39% of the time	2.43 – 3.57	Useful – Extremely Useful	5.34 – 6.66
Interaction Matrices	20 – 39% of the time	2.29 – 3.71	Useful	4.35 – 5.65
Simple Checklists	20 – 39% of the time	2.01 – 3.99	Somewhat Useful	3.34 – 4.66
Network Analyses	1 – 19% of the time	1.43 – 2.57	Somewhat Useful – Useful	2.34 – 3.66
Qualitative risk Assessment	40 – 59% of the time	2.15 – 3.85	Useful	4.67 – 5.33
Dialogues with Communities	**60 – 79% of the time**	**4.15 – 5.85**	**Extremely Useful**	**6.67 – 7.00**
Epidemiological Modeling	1 – 19% of the time	1.86 – 2.14	Useful	4.34 – 5.66

[a] The methods 'typically used' in practice to identify, predict or assess human impacts was rated on a scale from '0% of the time' = 1, '1-19% of the time' = 2, '20-39% of the time' = 3, '40-59% of the time' = 4, '60-79% of the time' = 5, '80-99% of the time' = 6, and finally '100% of the time' = 7.
[b] The usefulness of each method to identify, predict or assess human impacts is rated on a scale from 'not at all useful' = 1, 'somewhat useful' = 3, 'useful' = 5, 'extremely useful' = 7, 2,4 and 6 were intermediate ratings.

Questionnaire participants confirm the importance of 'epidemiological modeling', rated 'useful' by four groups and 'extremely useful' by 'consultants and proponents', however, it is indicated as being used only '1 to 19 percent of the time' in northern EA practice. This could be because EA practitioners tend to rely on quantitative data wherever possible (Davies, 1992) and social and psychological determinants of health are often difficult to quantify. In addition, there is a shortage of environmental epidemiological data beyond mortality in the North and across Canada such that very little is known regarding environmental exposures. For such methods to be useful in northern EA practice, relevant, high quality, information is necessary to assess the health effects associated with a proposed development project (Davies, 1992).

Discrepancies also exist between groups on the usefulness and frequency of some methods. For example, 'professional judgement', rated 'useful' or 'extremely

useful' by all participants, varies in the percentage of time it is used in northern EA practice to identify, predict or assess health impacts. Specifically, 'federal authorities' and 'consultants and proponents' differed from the other groups in that they indicated 'professional judgement' is used '80 to 99 percent of the time', while 'provincial authorities' suggested it is being used only '60 to 79 percent of the time' and for 'territorial authorities' and the 'others' groups, only '40 to 59 percent of the time' (Table 4.12). These findings relate to previous results which contend that all EA practitioners may not have the necessary expertise with regard to human health impact assessment. Currently, health professionals are playing insignificant roles in northern EA practice, leaving EA practitioners to rely on their own judgements and experience with regard to human health impacts. In addition, these findings suggest that across all methods in northern EA practice, identification of health impacts is less than sufficient.

The increasing complexity of EA has resulted in the development of various new innovative techniques and methods to provide and assess information with regard to potential impacts (Noble, 2005). Other methods used to assess health impacts identified by questionnaire participants, not shown in Table 4.12, include: 'quantitative risk assessment'; 'ecological risk assessment'; 'reviewing regional trends'; 'reviewing regional programs and services'; 'input/output models'; 'traditional ecological knowledge (TEK)'; 'dialogue with local government'; 'health authority involvement'; and 'hazard assessments'. The four methods rated as 'extremely useful' included 'ecological risk assessment' (used '80 to 99 percent of the time'); 'dialogue with local government' (used between '60 and 79 percent of the time'); 'health authority involvement' (used between '80 and 99 percent of the time') and finally 'hazard assessment' (used between '20 and 39 percent of the time').

The broad range of methods used is indicative of the increasing complexity of project-level EA (Munier, 2004). There is a need, however, to strengthen the process by incorporating methods which are best suited to the environment in which the project is taking place (Kemm, 2000). For example, uranium mining in northern Saskatchewan has been referred to as an "overwhelming influence on northern communities" (Wiles *et al.*, 1999: 108) and has led to the recognition that there is a need to understand the

Table 4.12. Methods used in practice to identify, predict or assess health impacts

METHODS	FEDERAL AUTHORITIES				PROVINCIAL AUTHORITIES				TERRITORIAL AUTHORITIES				CONSULTANTS & PROPONENTS				OTHERS			
	Methods 'typically' used		Usefulness Rating		Methods 'typically' Used		Usefulness Rating		Methods 'typically' used		Usefulness Rating		Methods 'typically' used		Usefulness Rating		Methods 'typically' used		Usefulness Rating	
	% of time[a]	95% CI	Useful-Ness[b]	95% CI	% of time	95% CI	Useful-ness	95% CI	% of time	95% CI	Useful-Ness	95% CI	% of time	95% CI	Useful-ness	95% CI	% of time	95% CI	Useful-ness	95% CI
Professional judgment	**80 – 99**	5.21 6.79	Useful	4.29 5.71	**60 – 79**	2.53 6.48	Useful	4.54 5.46	**40 – 59**	1.92 5.08	**Ext. Useful**	4.07 7.00	**80 – 99**	3.91 7.00	Useful	4.0 6.0	**40 – 59**	2.59 5.41	Useful	3.59 6.41
Comparative case study	20 – 39	2.41 3.59	Ext. Useful	5.00 7.00	20 – 39	3.0 3.0	Useful	1.17 4.83	60 – 79	3.02 6.98	Ext. Useful	4.42 7.00	40 – 59	2.13 4.87	Ext. Useful	5.0 7.0	1 – 19	1.29 2.71	Useful	1.88 6.12
Interaction matrices	20 – 39	2.01 3.99	Useful	4.00 6.00	60 – 79	3.71 5.29	Useful	1.76 6.24	20 – 39	0.13 4.87	Some-what	2.42 5.58	40 – 59	2.59 4.41	Useful	2.95 5.05	1 – 19	1.29 2.71	Useful	3.59 6.41
Simple checklists	40 – 59	3.01 4.99	Useful	2.05 3.95	60 – 79	2.13 6.87	Useful	2.09 3.91	40 – 59	0.44 7.00	Useful	4.21 5.79	20 – 39	3.0 3.0	Some-what	1.0 5.0	20 – 39	1.59 4.41	Useful	2.59 5.41
Network analyses	1 – 19	1.21 2.79	Useful	3.95 6.05	40 – 59	2.71 4.29	Some-what	2.38 4.62	20 – 39	0.00 5.27	Some-What	2.42 5.58	20 – 39	2.09 3.91	Some-what	0.77 5.23	1 – 19	1.29 2.71	Some-what	2.42 5.58
Qualitative risk assessment	20 – 39	2.01 3.99	Useful	4.42 5.48	40 – 59	0.84 7.00	Useful	1.17 4.83	1 – 19	1.21 2.79	Some-What	2.42 5.58	60 – 79	3.59 5.41	Ext. Useful	4.95 7.00	60 – 79	3.94 6.06	Useful	2.59 5.41
Dialogues with communities	60 – 79	3.1 6.9	**Ext. Useful**	7.00 7.00	40 – 59	0.84 7.00	**Ext. Useful**	5.09 6.91	80 – 99	4.02 7.00	**Ext. Useful**	6.0 6.0	60 – 79	4.04 4.96	**Ext. Useful**	4.95 7.00	60 – 79	3.94 6.06	**Ext. Useful**	6.29 7.00
Epidemiological modeling	1 – 19	1.61 2.4	**Useful**	4.47 5.53	1 – 19	2.0 2.0	**Useful**	1.63 4.37	1 – 19	0.37 4.37	**Useful**	3.17 6.83	1 – 19	2.0 2.0	**Ext. Useful**	4.47 5.53	1 – 19	0.44 2.56	**Useful**	4.21 5.79

[a] The methods 'typically used' in practice to identify, predict or assess human impacts was rated on a scale from '0% of the time' = 1, '1-19% of the time' = 2, '20-39% of the time' = 3, '40-59% of the time' = 4, '60-79% of the time' = 5, '80-99% of the time' = 6, and finally '100% of the time' = 7.

[b] The usefulness of each method to identify, predict or assess human impacts is rated on a scale from 'not at all useful' = 1, 'somewhat useful' = 3, 'useful' = 5, 'extremely useful' = 7, 2,4 and 6 were intermediate ratings.

important cultural impacts that large-scale industrial developments may have on Aboriginal communities, including human health impacts.

One method of particular importance in the North is TEK. The incorporation of TEK is increasingly accepted as a necessary component of northern EA practice and has the potential to contribute to sustainable resource use, particularly in the mining and energy resource sectors in the North (Peters, 2003; Usher, 2000). For example, including TEK in the EA process provides a more complete knowledge and understanding of the environment in which the development is proposed, the potential effects of that development, and the significance of those effects, including effects on human health (MVEIRB, 2004). Much debate exists on the appropriate definition (see Stevenson, 1996), however TEK generally refers to any group with knowledge about its environment derived from tradition and experience (Peters, 2003). However, just as ecosystems differ between landscapes, so do social, economic, and cultural systems (Karjala and Dewhurst, 2003). Usher (2000: 186-187) goes further, suggesting there are four categories of information to which TEK refers, namely:

- factual knowledge about the environment derived from individual observations;
- knowledge about the past and current use of the environment;
- culturally based value systems about appropriate behaviour concerning animals and the environment; and,
- culturally based cosmology that organises and serves as a framework for the other three categories.

The understanding that TEK extends from the 'ecological' environment, to include the knowledge and perspectives of the Aboriginal peoples[32] in the North on social, cultural, and spiritual matters, is more appropriately termed Traditional Knowledge (TK) or Local Knowledge (LK) (MVEIRB, 2004). Identifying TK or LK is the impetus behind public involvement in large-scale development projects in the North, which are often cross-cultural and transboundary projects (Karjala and Dewhurst, 2003). This terminology has been adopted by the MVEIRB in their draft guidelines (2004) entitled:

[32] This 'knowledge' can also be held by non-aboriginal peoples with long histories in the region (MVEIRB, 2004; Peters, 2003).

Incorporating Traditional Knowledge into the Environmental Assessment Process, the first of its kind in Canada.

These advances in the EA process, however, have not been carried over to the provincial level (Paci *et al*., 2002), and at the federal level, Paci *et al.* (2002) contend the *Act* undervalues TK and offers very little opportunity for involvement of First Nations and their knowledge in the assessment process. This disparity is reflected in the questionnaire results which reveal that over 80 percent of participants believe TK is 'strongly important' to consider while assessing health impacts, however, it is only being used between 20 to 39 percent of the time on average in northern EA practice (Table 4.13).

Table 4.13. Frequency versus importance of TK to assess human health impacts in northern EA practice

CURRENT PRACTICE	A) FREQUENCY		B) IMPORTANCE	
	median[a]	***95% CI***	***median***[b]	***95% CI***
ALL PARTICIPANTS a): n=48; b): n=53)	**20 – 39% of the time**	**2.32 – 3.68**	**Strongly Important**	**5.77 – 6.23**
Federal Authorities a) n=21; b) n=21)	20 – 39% of the time	2.21 – 3.69	Important	4.65 – 5.35
Provincial Authorities a) n=4; b) n=4)	20 – 39% of the time	1.02 – 4.98	Important	1.81 – 5.19
Territorial Authorities a) n=4; b) n=4)	40 – 59% of the time	0.34 – 6.66	**Strongly Important**	5.6 – 6.4
Consultants & Proponents a) n=13; b) n=13)	40 – 59% of the time	2.24 – 5.76	Important	4.2 – 5.8
Others a) n=6; b) n=6)	1 – 19% of the time	1.35 – 2.65	**Strongly Important**	5.82 – 6.18

[a] The frequency of TK to assess human health impacts in northern EA practice was rated on a scale from '0% of the time' = 1, '1-19% of the time' = 2, '20-39% of the time' = 3, '40-59% of the time' = 4, '60-79% of the time' = 5, '80-99% of the time' = 6, and finally '100% of the time' = 7.

[b] The importance of TK to assess human health impacts in northern EA practice was rated on a scale from 'not important' = 1, 'slightly important' = 2, 'somewhat important' = 3, 'moderately important' = 4, 'important' = 5, 'very important' = 6, and 'extremely important' = 7.

The lack of integration of TK in northern EA practice to assess human health impacts may be due, in part, to four reasons. First, the definitions of TEK and TK are inconsistent and unclear (Usher, 2000). Second, practitioners need, and are without, the appropriate methods for organizing and presenting this knowledge in the assessment process (Usher, 2000). Third, documenting TK requires trained intermediaries, but they in turn require the support and cooperation of those who have TK. Fourth, according to

Usher (2000), even if a community is in support of a project (which is not always the case), they are often reluctant to share TK with outside researchers because of a concern that it will be misinterpreted or taken out of cultural context (Stevenson, 1996). Usher (2000), therefore, argues that in some cases it is impractical and inappropriate to require proponents to incorporate TK in the EIS. However, he also contends that it is important to include TK in the public consultation phase.

As depicted in Figure 4.3, differences also exist between groups in terms of how often each group suggests TK is being used in practice versus its importance. The spread of data is largest for the 'territorial authorities' and 'others' (group number 3 and 5 respectively). For example, the medians for the 'frequency' and the 'importance' for the 'territorial authorities' is 3.5 and 6, and the medians for 'others' is 2 and 6. The 'territorial authorities' and 'others', for example, assigned TK the highest importance ('strongly important') compared to the other three groups (Table 4.13). These differences may be due in part to the 'territorial authorities' and 'others' previous experience and appreciation of TK. This is interesting as these two groups represent truly northern perspectives or worldviews.

To further investigate this, a costheta function was used to test the similarity between groups for both 'frequency' and 'importance' of TK in assessing human health impacts in northern EA (equation 3.1). As a result, the least similar groups on the 'frequency' of TK use to identify and/or evaluate potential health impacts in northern EA were 'territorial authorities' and 'others' at 64.7 percent similar (Table 4.14a). One would expect to see a high similarity percentage between the 'territorial authorities' and 'others' groups; however, this is not the case. The 'others' perceive that TK is only being used between '1 and 19 percent of the time' and the 'territorial authorities' suggest it is being used '40 to 59 percent of the time'. This difference may be due to amount of direct experience each group has conducting EA. For example, it may be that the 'others' group has special interest in northern development projects EAs, they may not have as much experience actually conducting the EA as the 'territorial authorities' have.

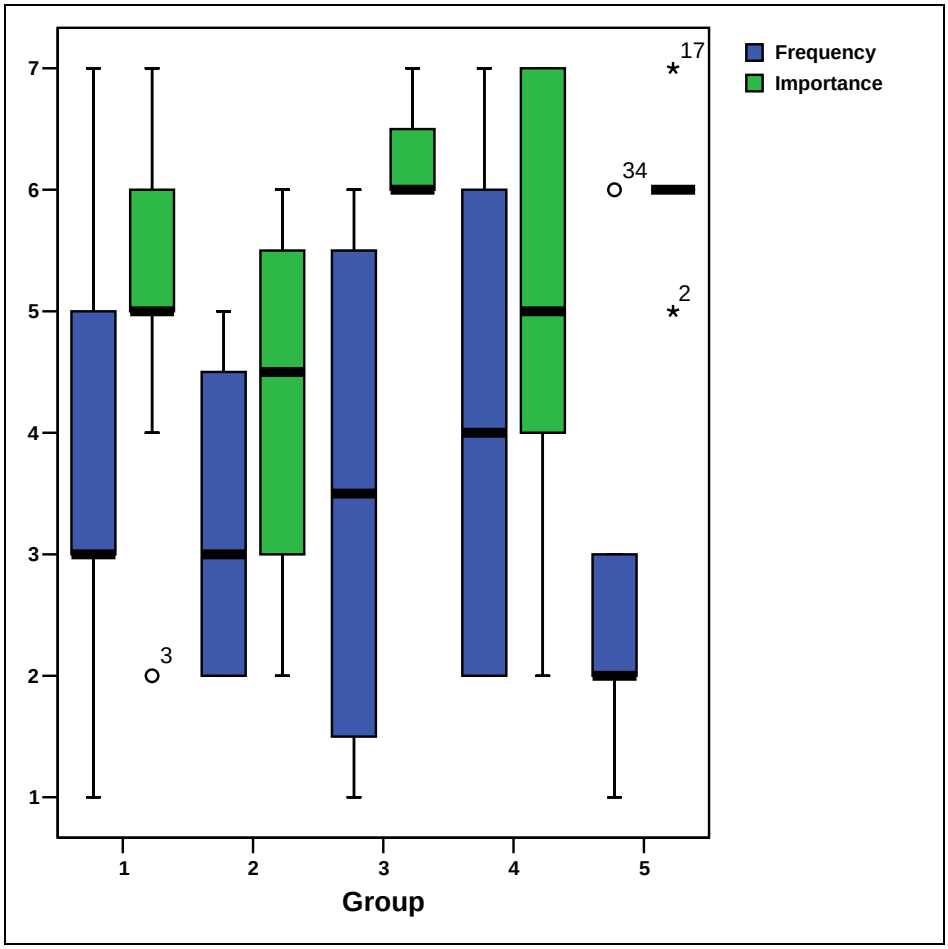

Figure 4.3. Frequency versus importance of TK in health assessment in northern EA by group, where: Group 1= Federal Authorities
Group 2= Provincial Authorities
Group 3= Territorial Authorities
Group 4= Consultants and Proponents
Group 5= Others

Table 4.14. Costheta values for a) frequency; and b) importance of TK in assessing human health impacts in northern EA

B) / ***A)***	***Federal Authorities***	***Provincial Authorities***	***Territorial Authorities***	***Consultants & Proponents***	***Others***
Federal Authorities		78.0% Similar	**65.7% Similar**	82.7% Similar	71.7% Similar
Provincial Authorities	82.1% Similar		82.6% Similar	76.7% Similar	87.8% Similar
Territorial Authorities	74.2% Similar	96.7% Similar		67.6% Similar	80.2% Similar
Consultants & Proponents	74.4% Similar	75.6% Similar	71.9% Similar		81.1% Similar
Others	78.4% Similar	69.4% Similar	**64.7% Similar**	86.3% Similar	

Another interesting finding is that the 'federal authorities' and 'territorial authorities' were found to be the least similar on the 'importance' of TK at 65.7 percent similar (Table 4.14b). This finding is indicative of each group's composition. For example, the 'federal authorities' have experience conducting EAs for development projects in the North; however, many live in the southern regions of Canada and therefore they may not fully understand northern dynamics involved with a development project. All of the 'territorial authorities' who participated in this study reside in the North and, as a result, may have a better understanding of northern health issues.

Incorporating contextually-relevant methods, including local culture and customs and diverse knowledge systems, are therefore necessary for EA practice to be successful in the North. Current practice needs to do a better job of tailoring the EA process to fit northern dynamics when it comes to development projects.

4.3 Health Determinants

Hancock *et al.* (1999) argue that the goal of society is to maximize human development and to achieve full human potential. The challenge then facing governments and industries is to support development initiatives while simultaneously enhancing health and well-being (Noble, 2005). To ensure this goal is met, indicators, or determinants of health, are needed. Determinants of health are not themselves 'health,' rather they are factors that influence or provide an indication of health (Kahan and Goodstadt, 1999), and help EA practitioners track health changes and measure progress, for better or for worse (Hancock *et al.*, 1999).

The nine health determinants, introduced in 1994 by Health Canada through the Advisory Committee on Population Health (see Figure 1.3), are consistent with the notion that health is much more than the absence of disease and includes social and psychological well-being. Though all nine determinants may not warrant detailed review in every project, *all* should be considered (Kwiatkowski and Ooi, 2003). However, while the physical environmental and physical health determinants are well understood, little is known about social determinants, including psychological and spiritual well-being, which are difficult to measure in current EA practice (CEARC, 1992). In addition, the determinants of health currently do not take into consideration the uniqueness of northern communities (FNIHB, 2001) and the understandings and

beliefs of the people who live there (O'Neil and Solway, 1990). For example, ensuring the integrity of traditional or country foods, free from contamination, as well as the psychological, social, cultural and spiritual values are critical components of northern EA practice (Kwiatkowski and Ooi, 2003; O'Neil and Solway, 1990).

4.3.1 Current Practice

From a human health perspective, the main purpose of conducting an EA is to ensure that any adverse impacts are identified and mitigated and that both human health and quality of life are maintained or improved (INAC, 2003). For example, an interviewee from Environment Canada contended:

> People may not realize it, but the main issue in EA is always health and quality of life (Environment Canada per. Comm., 2004).

However, despite the inclusion of some social and economic determinants of health in the Determinants of Health Framework, questionnaire results indicated that EA practitioners and administrators perceive 'physical environments' to be the most important determinant, assigning a rating of 'very important'. 'Working conditions' received the second highest rating, between 'important' and 'very important', while the remaining determinants shared equal importance (Table 4.15a).

Not surprisingly then, when asked to rate the *performance* of recent northern EA practices with regard to the incorporation of the nine health determinants, 'physical environments' was rated the highest, or 'average to above average' (Table 4.15b). The medians of the remaining determinants of health indicated 'income and social status', 'education', 'physical health' and 'working conditions' shared equal standing with only an 'average' performance, followed by 'health services' receiving an intermediate rating of 'below average to average' and 'personal health practices and coping skills,' 'social support networks' and 'healthy child development' receiving the poorest performance rating of 'below average.' A statistical difference can be found to exist between the *importance* and the *performance* for all health determinants at the 95 percent confidence interval for the median except 'education,' where the confidence intervals (4.55 to 5.45 and 3.38 to 4.62) overlap. This difference suggests that in practice the performance of

northern EA based on incorporating the nine determinants of health does not reflect the perceived importance of the determinants.

Table 4.15. Importance versus performance of health determinants in northern EA

DETERMINANT	***A) IMPORTANCE***		***B) PERFORMANCE***	
	Median[a]	***95% CI***	***Median***[b]	***95% CI***
Income and social status	Important	4.77 – 5.23	Average	3.5 – 4.5
Education	Important	**4.55 – 5.45**	Average	**3.38 – 4.62**
Physical health	Important	4.77 – 5.23	Average	2.88 – 4.12
Personal health practices & coping skills	Important	4.55 – 5.45	Below Average	2.5 – 3.5
Social support Networks	Important	5.55 – 6.45	Below Average	2.5 – 3.5
Working conditions	Important – Very Important	5.77 – 6.23	Average	3.25 – 4.75
Physical Environments	**Very Important**	5.77 – 6.23	**Average - Above Average**	4.25 – 4.75
Healthy child Development	Important	4.55 – 5.45	Below Average	2.38 – 3.62
Health services	Important	4.55 – 5.45	Below Average - Average	3.25 – 3.75

[a] The importance of including human health in each of the EA components is rated on a scale from 'not important' = 1, 'slightly important' = 2, 'somewhat important' = 3, 'moderately important' = 4, 'important' = 5, 'very important' = 6, and finally 'extremely important' = 7.
[b] The performance of recent northern EA practices with regard to the incorporation of each of the determinants of health was rated on a scale from 'very poor' =1, 'poor' =2, 'below average' =3, 'average' =4, 'above average' = 5, 'very good' = 6, and finally, 'excellent' = 7.

These findings are consistent with the notion that a narrow scope of health is often adopted in northern EA practice (Kwiatkowski and Ooi, 2003). For example, in terms of ratings, Table 4.15 is indicative of the traditional view of health in EA to include physical components and components for which the proponent has direct control over (e.g. education and training, working conditions, and health services). Other health components such as social support networks, for example, are things that the proponent cannot directly control in EA. However, it has been demonstrated that proponents of northern development projects can go beyond including only those health components that they have direct control over. For example, one innovative component of the Ekati project (see section 2.4.2) was the development of community-based social support programs for residents and local mine employees to assist in stress, family, and financial

management. Such innovation was not evident in the earlier Rabbit Lake and Cluff Lake projects. In both the Rabbit Lake and Cluff Lake assessments, the scope of health was restricted to the physical components of health impacts, in these cases, the risk of mine worker exposure to radiation. The proponents for both projects stated that such social health concerns are simply beyond the control of the proponent or too complex to address. Though difficult, this assertion is simply not the case, as demonstrated by the Ekati project.

Differences were found to exist between participant groups on the *importance* and *performance* of recent northern EA practices with regard to the incorporation of the nine health determinants (Table 4.16), particularly 'territorial authorities' and 'others'. For example, all groups perceived 'physical environments' to be 'very important' in northern EA; however, 'territorial authorities' believed 'income and social status,' 'education,' 'physical health,' 'social support networks' and 'working conditions' share equal standing as 'extremely important'. The 'others' group assigned the lowest ratings for the performance of recent northern EAs (in terms of incorporating each of the determinants of health into EA practice) (Table 4.16). For example, the 'others' group perceive 'income and social status', 'education' and 'physical environments' to be 'below average'; 'physical health', 'working conditions' and 'health services' to be 'poor'; and 'physical health practices and coping skills', 'social support networks' and 'healthy child development' to be 'very poor'.

These findings are consistent with previous results in that 'territorial authorities' and 'others' disagree with the other three groups, in that there seems to be two sides, those who are representing the values and beliefs of northern residents with regard to human health impacts from development, and those who are conducting the assessments but do not share the same perspective as do members of the communities. The 'territorial authorities' and 'others,' therefore, perhaps represent a more accurate picture of the state-of-EA practice in the North such that they recognize the importance of the social determinants of health and acknowledge poor performance of integrating them into northern EA practice.

Table 4.16. Importance versus performance of health determinants in northern EA

DETERMINANT	FEDERAL AUTHORITIES				PROVINCIAL AUTHORITIES				TERRITORIAL AUTHORITIES				CONSULTANTS & PROPONENTS				OTHERS			
	Importance of health determinant integration		Perform. of health determinant integration		Importance of health determinant integration		Perform. of health determinant integration		Importance of health determinant integration		Perform. of health determinant integration		Importance of health determinant integration		Perform. of health determinant integration		Importance of health determinant integration		Perform. of health determinant integration	
	Imp.[b]	95% CI	Per.[a]	95% CI	Imp.[b]	95% CI	Per.[a]	95% CI	Imp.[b]	95% CI	Per.[a]	95% CI	Imp.[b]	95% CI	Per.[a]	95% CI	Imp.[b]	95% CI	Per.[a]	95% CI
Income and social status	Imp.	4.65 5.35	Ave.	3.46 4.54	Mod. Imp.	2.02 5.98	Avg.	2.31 4.69	**Ext. Imp.**	5.31 7.00	Abv. Avg.	1.34 7.00	Imp.	4.16 5.84	Avg.	3.13 4.88	Imp.	4.70 5.30	**Bel. Avg.**	2.29 3.71
Education	Imp.	4.65 5.35	Bel. Avg.	2.62 3.38	Imp.	2.92 6.08	Avg.	1.92 5.08	**Ext. Imp.**	5.31 7.00	Abv. Avg.	2.23 7.00	Imp.	4.15 5.85	Abv. Avg.	3.56 4.44	Imp.	5.00 5.00	**Bel. Avg.**	2.29 3.71
Physical health	Imp.	4.31 5.69	Bel. Avg.	2.75 4.25	Imp.	4.60 5.40	Above Avg.	2.92 6.08	**Ext. Imp.**	5.31 7.00	Avg.	1.23 6.77	Very Imp.	5.58 6.42	Avg.	3.12 4.88	Very Imp.	6.00 6.00	**Poor**	1.29 2.71
Personal health practices	Imp.	4.31 5.69	Bel. Avg.	2.28 3.72	Imp.	3.81 5.19	Bel. Avg.	1.42 4.58	Very Imp.	4.31 6.69	Avg.	1.92 5.08	Imp.	3.65 5.35	Avg.	3.12 4.88	Very Imp.	5.70 6.30	**Very Poor**	0.29 1.71
Social support networks	Imp.	4.31 5.69	Bel. Avg.	2.09 3.91	Imp.	3.02 6.98	Avg.	2.31 4.69	**Ext. Imp.**	5.31 7.00	Avg.	0.73 6.27	Imp.	4.15 5.85	Avg.	2.40 5.60	Very Imp.	4.81 7.00	**Very Poor**	0.29 1.71
Working conditions	Very Imp.	4.65 5.35	Avg.	3.47 4.53	Imp.	4.21 5.79	Avg.	1.13 5.87	**Ext. Imp.**	5.31 7.00	Avg.	0.73 6.27	Very Imp.	5.15 6.85	Abv. Avg.	4.12 5.88	Imp.	4.40 5.60	**Poor**	1.29 2.71
Physical environments	**Very Imp.**	5.65 6.35	Avg.	3.28 4.72	**Very Imp.**	4.71 6.29	Very Good	3.13 7.87	**Very Imp.**	5.21 6.79	Avg.	0.73 6.27	**Very Imp.**	5.15 6.85	Abv. Avg.	4.12 5.88	**Very Imp.**	5.70 6.30	**Bel. Avg.**	1.59 4.41
Healthy child development	Mod. Imp - Imp.	4.15 4.85	Bel. Avg.	2.62 3.38	Mod. Imp.	1.13 5.87	Poor	0.42 3.58	Imp.	4.21 5.79	Bel. Avg.	1.02 4.98	Imp.	3.65 5.35	Avg.	2.10 5.90	Very Imp.	4.81 7.00	**Very Poor**	1.00 1.00
Health services	Imp.	4.29 5.71	Bel. Avg.	2.23 3.77	Mod. Imp.	1.63 6.37	Avg.	1.92 5.08	Very Imp.	4.42 7.00	Avg.	1.52 5.48	Imp.	3.73 6.27	Avg.	3.12 4.88	Very Imp.	5.11 6.89	**Poor**	0.59 3.41

[a] The importance of including human health in each of the EA components is rated on a scale from 'not important' = 1, 'slightly important' = 2, 'somewhat important' = 3, 'moderately important' = 4, 'important' = 5, 'very important' = 6, and finally 'extremely important' = 7.

[b] The performance of recent northern EA practices with regard to the incorporation of each of the determinants of health was rated on a scale from 'very poor' =1, 'poor' =2, 'below average' =3, 'average' =4, 'above average' = 5, 'very good' = 6, and finally, 'excellent' = 7.

A poor physical environment is known to have a negative effect on health; however, the physical environment, is in part, a function of the social environment (Sagar, 1994). According to Davies (1992), EA practice would benefit from a greater emphasis on the social determinants of health, including spiritual health and well-being. Participants agreed, rating all of the determinants, including the physical and the social, as 'important' or higher. However, how often the determinants are being incorporated is another indication of the state-of-EA practice in the North. The 'physical environment' and 'physical health' determinants received the greatest attention (Davies, 1992) (Table 4.17). It is important to notice, however, that 'income and social status', 'education' as well as 'working conditions' were ranked higher than 'physical health' and used in northern EA on average in '40 to 59 percent of all cases'. These findings are consistent with the notion that human's overall human health is a function of complex interrelationships among social, economic, political and cultural health determinants with the natural environment (Health Canada, 1999). For example, income is one of the most important determinants of health, even in the North (Health Canada, 1999; Federal/Provincial/Territorial Committee on Population Health, 1994). One interviewee from Health and Social Services located in the North suggested that:

> The health determinants are all connected to one another. For example, personal health practices are linked to employment and income. Income, however, impacts on housing, which impacts on health (Yellowknife Health and Social Services per. Comm., 2004c).

Kwiatkowski and Ooi (2003) contend that Aboriginal concerns about northern development go beyond the physical environmental changes to include specific health and well-being matters, such as: socioeconomic and sociocultural stress, racism, assistance with finances and budgets, social diseases, personal development, self-esteem and confidence, positive mental health, and assistance to families left with one or no parents as a result of employment opportunities outside the community. Davies and Sadler (1997) agree, suggesting that a broader understanding of the determinants of health be incorporated into all stages of EA. This contention is reflected in the following two quotes:

> Humans are an integral part of the physical environment but also 'benefit' from the social and economic aspects of projects. Reviewing just the physical determinants of health limits the scope of significance assessment (Policy and Planning Advisor, Health Canada per. Comm., 2004).

> It makes sense to me to identify baseline human health conditions and assess effects and propose mitigation based on a detailed project description (Consultant per. Comm., 2004).

To further examine this issue, participants were asked how often the determinants of health are included in the description of the project or environmental setting; determination of project significance; and follow-up and monitoring; three important stages of northern EA.

Table 4.17. Frequency of use of health determinants in northern EA

DETERMINANT	***FREQUENCY OF HEALTH DETERMINANTS*** **ALL PHASES**	
	Median[a]	***95% CI***
Income and social status	40-59%	3.27 – 4.73
Education	40-59%	3.27 – 4.73
Physical health	20-39%	2.76 – 4.24
Personal health practices and coping skills	1-19%	1.51 – 2.49
Social support networks	20-39%	2.51 – 3.49
Working conditions	40-59%	3.76 – 4.24
Physical environments	**60-79%**	4.51 – 5.49
Healthy child development	1-19%	1.76 – 2.24
Health services	20-39%	2.76 – 3.24

[a] The median was calculated for each determinant, such that 0% of all cases = 1, 1-19% of all cases = 2, 20-39% of all cases = 3, 40-59% of all cases = 4, 60-79% of all cases = 5, 80-99% of all cases = 6, and finally 100% of all cases = 7.

The results show that 'physical environments' are used most often in each phase; between '60 and 79 percent of all cases' in the 'project description' and 'determining impact significance' (Table 4.18ab), and '40 to 59 percent of all cases' during 'follow-up and monitoring' (Table 4.18c). However, when asked how often the determinants of health are used in 'follow-up and monitoring' during post-project assessment in northern EA practice, participants indicated that other than 'physical environments', all other determinants are only followed-up and monitored between '1 and 19 percent of the time' (Table 4.18c). This is a significant finding in that the

determinants of health, other than physical environmental determinants, are not being used to monitor health. It is therefore not known whether health is actually being affected by project development with any degree of certainty.

Table 4.18. Frequency of health determinants in several northern EA phases

DETERMINANT	***A) PROJECT DESCRIPTION***		***B) IMPACT SIGNIFICANCE***		***C) FOLLOW-UP & MONITORING***	
	Median[a]	***95% CI***	***Median***[a]	***95% CI***	***Median***[a]	***95% CI***
Income and social status	40-59%	3.12 – 4.88	40-59%	3.26 – 4.74	**1-19%**	1.48 – 2.52
Education	40-59%	2.79 – 4.21	20-39%	2.51 – 3.49	**1-19%**	1.74 – 2.26
Physical health	20-39%	2.76 – 3.24	20-39%	2.26 – 3.74	**1-19%**	1.48 – 2.52
Personal health practices and coping skills	1-19%	1.52 – 2.48	1-19%	1.51 – 2.49	**1-19%**	1.74 – 2.26
Social support Networks	20-39%	1.79 – 3.21	20-39%	2.51 – 3.49	**1-19%**	1.48 – 2.52
Working Conditions	20-39%	2.17 – 3.83	20-39%	2.26 – 3.74	**1-19%**	1.74 – 2.26
Physical Environments	**60-79%**	4.05 – 5.95	**60-79%**	4.51 – 5.49	**40-59%**	4.22 – 5.78
Healthy child Development	1-19%	1.64 – 2.36	1-19%	1.75 – 2.25	**1-19%**	1.74 - 2.26
Health services	20-39%	2.17 – 3.83	20-39%	2.26 – 3.74	**1-19%**	1.74 – 2.26

[a] The median was calculated for each determinant, such that 0% of all cases = 1, 1-19% of all cases = 2, 20-39% of all cases = 3, 40-59% of all cases = 4, 60-79% of all cases = 5, 80-99% of all cases = 6, and finally 100% of all cases = 7.

Follow-up involves continuous data collection to monitor compliance with conditions and regulations; monitoring the effectiveness of impact management and mitigation measures and the accuracy of impact predictions (Noble, 2005; Petts, 1999). As the determinants of health provide an indication of health, follow-up and monitoring provides an 'early warning indicator' of actual health threats. In addition, follow-up enables maintenance of trust and credibility between the proponent and the public, particularly important for the mining and energy resource sectors in the North (Stevenson, 1996).

Recently, however, northern EA practice has made some improvement such that social determinants of health are being used in some cases. For example, the BHP Billiton Ekati Project (see section 2.4.2) demonstrates an integrated EA process. Seven

of the nine determinants of health were taken into account by the mining company, including: income and social status; social support networks; education; employment and working conditions; physical environments; personal health practices and coping skills; and, health services (a complete review is available from Kwiatkowski and Ooi, 2003). The project created 700 permanent jobs, 60 percent of which were staffed specifically by northern residents, half of which were Aboriginals (BHPB, 1998). All employees were incorporated into a health care plan that used traditional health care practices in conjunction with western beliefs.

Not only has BHPB identified, assessed, and mitigated the negative environmental and social impacts, the company also identified and mitigated perceived concerns and, wherever possible, tried to enhance the positive aspects of the project (BHPB, 1998). However, notwithstanding cases such as Ekati, EA practice can be further improved by including additional determinants of health that are specific to the North.

4.3.2 Additional Determinants

In order to assess impacts on human health, positive or negative, the health determinants chosen must be a function of culture, geography and history (Kahan and Goodstadt, 1999). This is especially the case in the North, where unique cultural, social and spiritual realities exist (Mulvihill, 1990). Moreover, the increase in northern development in recent years makes it particularly important to consider all unique aspects when conducting an EA as the cumulative effects on human health may be large (Burris and Canter, 1997). For example, an interviewee from Health and Social Services in the North contended:

> People in the North are already stressed. Communities are isolated to a large degree and it is more difficult to get health services. Therefore, the impact of change is great in the North (Yellowknife Health and Social Services Authority per. Comm., 2004b).

Another interviewee from Health and Social Services in the North suggested there are three major differences between the North and South that need to be considered in EA, namely:

- Language and literacy. Trying to explain results back to the people becomes difficult. All concepts do not translate.

- Geographical expanse. It is so spread out in the North. The cost is a big issue as well as the small population (isolation).

- History of development. When you look at how the North has developed, you see people are living differently now. People are moving to communities but still draw from the land for food. (Yellowknife Health and Social Services Authority per. Comm., 2004)

These differences, however, are not reflected in Health Canada's Determinants of Health Framework (see Figure 1.3), as the determinants were derived from research conducted in the most populated regions of Canada and therefore do not take into account the unique lifestyles of northern residents. One interviewee with Health Canada for example argued:

> It is becoming more important. Humans are a part of the environment. People are tied to the environment, especially in the North. People are living off the land (Epidemiological Advisor per. Comm., 2004).

An interviewee with Environment Canada agreed, suggesting:

> Northern communities do not enjoy the same kind of facilities, hospitals, community clinics, pharmacies etc. as do the southern communities. Moreover, huge distances and bad weather conditions make it much more difficult to maintain the same level of health delivery system for the northern communities (Environment Canada per. Comm., 2004).

As a result, there may be other determinants typically addressed or determinants that should be addressed in northern EA practice. To that end, EA practitioners and administrators identified several additional determinants of health that are typically addressed (>60 percent of the time) in northern EA practice, and include:

- culture/cultural activities;
- substance abuse (smoking, alcohol, drugs);
- consumption of country food;
- Traditional Ecological Knowledge (TEK);
- transportation; and,
- social services (emergency services; infrastructure).

While these 'determinants' are not included in Health Canada's framework, they are being used in some northern EAs to assess the impacts on health due to development projects. Their inclusion highlights inconsistencies in northern EA practice and demonstrates deficiencies in the Health Determinants Framework.

In addition, participants identified other health determinants that *should* be included within northern EA, most notably: cultural activities (including traditional landuse); diet/country food; gender and social problems (i.e. alcohol/substance abuse, family violence, etc.). These findings support the notion that physical environmental impacts are not the only important considerations in EA. One EA consultant agreed, and stated:

> Although physical health impacts are not a concern, the impacts to spiritual, cultural, economic and social infrastructure are large compared to environmental impacts (Golder Associates Ltd. per. Comm., 2004).

The second Canadian Arctic Contaminants Assessment Report on Human Health (2003) goes further suggesting that additional determinants such as lifestyle (alcohol consumption, smoking, and substance abuse), diet, as well as socioeconomic status and genetic predisposition should be considered when assessing the health status of northern residents.

Some development projects in the North have gone beyond Health Canada's determinants to include lifestyle and traditional land use activities, just to name a few. For example, and as previously discussed in Chapter 2, the McArthur River project (1999), one of the most productive uranium mines in the world, explicitly defined health in its EIS and panel report to include social well-being and quality of life. The community health assessment, one of three health-based monitoring and assessment programs within the EA, included several determinants of health such as: employment; income; education; housing; lifestyle; and traditional land use activities of northern residents. This latter component is particularly important in the North, as one Medical Officer pointed out:

> Understanding the value First Nations and northern residents place on the land is important for consideration. As the determinants of health are broad, so is the use of land. Protecting the rights and lifestyle instead of providing or compensating should be considered in northern development projects (Northwestern Health Unit per. Comm., 2004).

An Epidemiological Advisor with Health Canada went further by suggesting:

> There is a huge difference between northern and non-northern regions. The life style issue, more than anything else, is the most important difference. For example, in northern stores, non-traditional foods are introduced which changes their lifestyle (Health Canada per. Comm., 2004a).

The scope of health considered in the McArthur River EA and Panel Report therefore reflects well on the EA process and includes determinants of health specific to the North. An interviewee with the International Health Authority located in the North agrees the scope of the determinants need to be broadened and suggested:

> A holistic approach to health needs to be taken. New determinants …need to be included (Planner, International Health Authority per. Comm., 2004).

Interview and questionnaire results, in addition to previous case experience, demonstrates the need and ability of northern EA practice to broaden the scope of health determinants and incorporate new determinants specific to the North.

4.3.3 Gender

Gender-based differences are slowly being recognized as important factors in northern EA, particularly in the mining and energy resource sectors. The link between gender equality and sustainable development, understood internationally, now recognized in Canada, is highlighted by Dale (1998), who noted:

> Gender equality is seen as a fundamental means to the reconciliation of social imperatives with ecological and economic imperatives. Gender equality, is therefore, one of the prerequisites to moving to a more sustainable Canadian society. Indeed, gender equality may well be the most important tool for the more rapid diffusion of sustainable practices throughout Canadian society.[33]

Despite this, natural resource exploitation in the North has traditionally ignored the socio-economic and cultural implications of such developments, with detrimental consequences for women and their families (Archibald and Crnkovich, 1999). For example, northern development projects often require workers to fly in and out of the site, often being away from their families for weeks at a time (Noble, 2005; Shrimpton

[33] See http://www.royalroads.ca/ste/research/gender/AB_Tools.html#ABToolGenAna

and Storey, 1992). The workers are predominately men, which leaves the females alone to take on many of the previously shared family responsibilities (Archibald and Crnkovich, 1999). This disparity is believed by some to be contributing to the increase in social problems in the North (Ritter, 2001) as a result of development projects.

Over time, however, attempts have been made to correct this. In 1995, for example, the Government of Canada adopted a policy as part of its larger commitment to gender equality that requires "all federal departments and agencies to conduct gender-based analysis of future policies and legislation, where appropriate" (Ottawa, 1998). That same year, the new environmental approval process came into effect under the *Act*. As a result, the Voisey's Bay case study (previously discussed) was one of the first major development projects to come under the new process and included gender-based health concerns in the project assessment (Archibald and Crnkovich, 1999). The Panel was also required to develop guidelines to be followed by the project developer – Voisey's Bay Nickel Company (VBNC) – when preparing its EIS. In addition to requiring the proponent to identify how the project would affect women differently from men, the guidelines also directed VBNC to describe several socio-economic indicators, including, but not limited to: demographics; employment; income; education and skills; use of land and resources; housing; quality of life; health; morbidity and mortality; diet, including country food; and the interrelations of all of the indicators listed above (Archibald and Crnkovich, 1999). For these reasons, the Voisey's Bay project set a precedent with regard to the 'requirement' to incorporate gender-based issues in northern development.

Based on their experiences, participants were asked about the frequency and importance of considering gender-based differences in northern EA. The results revealed that when the determinants of health are being addressed in northern EA, gender-based differences are only being considered between 1 and 19 percent of the time (Table 4.19a). However, 'health services' was the only determinant rated as 'moderately important' in terms of gender-based differences, while the remaining 8 determinants were rated as 'important' (Table 4.19b). In addition, a statistical difference at the 95 percent confidence interval for the median was found to exist between the frequency and importance of gender-based issues in northern EA. The results suggest

that while there is a recognized importance and policy requirement to address gender-based differences in northern EA, in practice, it is currently not being done.

Table 4.19. Importance and frequency of gender-based differences in northern EA

DETERMINANT	***A) FREQUENCY***		***B) IMPORTANCE***	
	Median	***95% CI***	***Median***	***95% CI***
Income and social status	**1-19%** of the time	1.23 – 2.77	**Important**	4.40 – 5.60
Education	**1-19%** of the time	1.74 – 2.26	**Important**	4.28 – 5.72
Physical health	**1-19%** of the time	1.49 – 2.51	**Important**	4.40 – 5.60
Personal health practices and coping skills	**1-19%** of the time	1.74 – 2.26	**Important**	4.16 – 5.84
Social support Networks	**1-19%** of the time	1.74 – 2.26	**Important**	4.28 – 5.72
Working conditions	**1-19%** of the time	1.49 – 2.51	**Important**	4.16 – 5.84
Physical environments	**1-19%** of the time	1.74 – 2.26	**Important**	4.28 – 5.72
Healthy child Development	**1-19%** of the time	1.74 – 2.26	**Important**	4.16 – 5.84
Health services	**1-19%** of the time	1.74 – 2.26	**Moderately Important**	3.28 – 4.72

[a] The frequency gender-based differences are considered in northern EA for each determinant of health was rated on a scale from '0% of the time' = 1, '1-19% of the time' = 2, '20-39% of the time' = 3, '40-59% of the time' = 4, '60-79% of the time' = 5, '80-99% of the time' = 6, and finally '100% of the time' = 7.

[b] The importance of considering gender-based differences in northern EA for each determinant of health was rated on a scale from 'not important' = 1, 'slightly important' = 2, 'somewhat important' = 3, 'moderately important' = 4, 'important' = 5, 'very important' = 6, and finally 'extremely important' = 7.

4.4 Barriers and Challenges

Recently, several initiatives concerning health and EA have taken place in Canada (CEARC, 1992) (for example, the development of Health Canada's handbook on HIA and the adoption of the MVRMA); however, predicting human health effects in EA remains problematic (Steinemann, 2000; Sloof, 1995). To ensure continued environmental improvement, it is necessary to highlight the limitations to increased understanding and develop targets for action (Trudgill, 1990). To that end, Trudgill (1990) identified six major groups of barriers to a better environment, namely: agreement; knowledge; technological; economic, social and political (AKTESP) barriers. For example, practitioners may not always agree on the goals, aims, means,

and scope of environmental problems and how to overcome them. If consensus is reached, adequate evidence or knowledge is needed and technology must be available. In this way, each barrier needs to be overcome if the goal of a better environment is to be achieved. Based on Trudgill's AKTESP framework, challenges facing EA practitioners and administrators specific to human health inclusion are examined further (Table 4.20).

Table 4.20. Barriers facing EA practitioners and administrators

BARRIER	DEFINITION
Agreement	Agreement concerning the role of HIA in EA, its scope, the most appropriate from, the types of health issues that should be addressed, its timing and focus. Agreement over the responsible authority.
Knowledge	Knowledge about the HIA process. Availability/adequacy of knowledge about the baseline environmental, social and economic factors which are relevant to HIA. The extent to which HIA predictions and mitigation measures are followed-up.
Technology	Availability of appropriate methods, techniques and methodologies to facilitate HIA practice in an EA context.
Economic	Availability of financial resources to conduct HIA. The various costs and financial responsibilities associated with conducting HIA.
Social	Organizational coordination and inter-agency cooperation. Nature of public involvement and the communication of results.
Political	Implementation of HIA results. Sensitivity of health issues. Transparency in the assessment process. Accountability of the HIA process.

Source: Based on Trudgill's AKTESP framework (1990)

Based on literature, questionnaire, interview results and case examples, all six barriers are evident in northern EA practice. For example, in a report prepared for the CEARC, Mulvihill (1990) argued there are four interrelated forces contributing to the contextual uncertainty in the North and pose difficulties for EA practitioners. These include: fundamental political changes; social changes; economic changes; and the notion that arctic ecology is not well understood. Specific to the challenges of integrating human health in EA, a research prospectus summarizing CEARC's investigation of human health and EA (CEARC, 1992: 7-8) outlines several interrelated information and communication issues that limit the comprehensiveness of EAs, including:

1). Lack of data on baseline health status. There is often insufficient scientific or quantitative data available to practitioners and administrators conducting EAs. In addition, the data which are available are limited to mortality. Health conditions for which physicians are not always consulted, such as rashes and similar ailments, are often absent.

2). Lack of health information associated with environmental stressors. Establishing links between human health and environmental stressors is often difficult in EA. This may be due to methodological issues or simply that the effects are too small or non-existent.

3). Data synthesis, evaluation and interpretation. According to CEARC (1992), data on human health and the environment are rarely synthesized, evaluated and interpreted well. Often, too many uncertainties exist to provide clear cause and effect relationships between development projects and the effects on human health. However, evaluation and interpretation are essential for the public to be informed.

4). Information management, accessibility and confidentiality. Coordination between departments and agencies collecting information leaves something to be desired. As a result, duplication, gaps in coverage, incomparable data sets and wasted time and resources exist. In addition, health and environmental data are often not collected or managed in consistent or comparable methods.

5). Resource requirements. In order to conduct a comprehensive EA – one that includes human health effects, a considerable amount of personnel and financial resources are needed. As a result, human health may only be considered if specific health problems exist, and the links between environmental change and human health impacts forgotten.

However, even if relevant health data were readily available to EA practitioners and administrators, questionnaire results indicate a lack of agreement on the scope of health issues. For example, the two main barriers identified by EA practitioners and administrators include: 1) an incomplete understanding of the scope of health in EA; and 2) the absence of standardized procedures of assessing human health impacts in EA (Table 4.21). An interviewee with Health and Social Services in the North supported this conclusion, stating the main barrier remains a "lack of understanding of the health determinants" (Yellowknife Health and Social Services per. Comm., 2004c). In addition, the lack of knowledge relevant to HIA in the North is evident in one of the case examples previously discussed. For example, in the Rabbit Lake - Eagle Point Extension project, despite intense biophysical environmental

Table 4.21. Barriers to effective health integration

BARRIERS	ALL PARTICIPANTS	FEDERAL AUTHORITY	PROVINCIAL AUTHORITY	TERRITORIAL AUTHORITY	CONSULTANTS & PROPONENTS	OTHERS
	Rating Median[a]	Rating Median	Rating Median	Rating Median	Rating Median	Rating Median
A) Incomplete understanding of the scope of health in EA	Significant (5)	Significant (5)	Significant (5)	Significant (5)	Significant (5)	Significant – Extremely Significant (6)
B) Absence of standardized procedures of assessing human health impacts in EA	Significant (5)	Significant (5)	Significant (5)	Significant (5)	Significant – Extremely Significant (6)	Significant – Extremely Significant (6)
C) Lack of communication and coordination between EA practitioners and health professionals	Significant (5)	Significant (5)	Significant (5)	Significant (5)	Significant (5)	Significant – Extremely Significant (6)
D) Difficulty obtaining health data	Significant (5)	Significant (5)	Significant (5)	Significant (5)	Significant (5)	Significant – Extremely Significant (6)
E) Legislation too restrictive or insufficient	**Somewhat significant – Significant (4)**	Somewhat significant – Significant (4)	Significant (5)	Significant (5)	Significant (5)	Somewhat significant – Significant (4)
F) Economic barriers (i.e. lack of funding)	Significant (5)	Significant (5)	Significant (5)	Significant – Extremely Significant (6)	Somewhat significant – Significant (4)	Significant (5)
G) Temporal barriers (i.e. lack of time)	Significant (5)	Significant (5)	Significant (5)	Somewhat Significant (3)	Somewhat significant – Significant (4)	Significant – Extremely Significant (6)

[a] Participants were asked to rate the significance of each potential barrier from: '1' = not significant, '3" = somewhat significant, '5' = significant, '7' = extremely significant, '2', '4', '6' = intermediate ratings. This column represents the median value for all groups combined.

monitoring, no comparable, consistent data were gathered to establish the actual health impacts of mining operations, and therefore no long-term impacts could be predicted. Consequently, finding consensus on the role of health in EA practice, its scope and the types of health issues that should be addressed, is arguably the first step to overcoming all other barriers. Without consensus, health inclusion in EA practice will remain inconsistent and poorly done.

Language and communication barriers are also evident. Previous results indicated that 'dialogue with communities' was rated as 'extremely useful' to identify, predict or assess human health impacts and is being used between '60 and 70 percent of the time.' However, the information gathered from communities does not necessarily involve the use of TK, which was rated as 'strongly important' in health assessment but is only being used '20 to 39 percent of the time.' This is especially true for the 'others' group, who believe TK is only being used 1 to 19 percent of the time to assess health in northern EA practice. This is an interesting finding in that the 'others' group represents Aboriginal perspectives or worldviews, important in the North.

Currently, legislative or political barriers are also evident in northern EA practice. For example, the median for all barriers was '5' or 'significant', except for 'legislation being too restrictive or insufficient', rated '4', an intermediate rating between 'somewhat significant' and 'significant'. This is a particularly interesting finding, such that legislative requirements for EA are often in debate. Questionnaire results indicate that a greater percentage of EA practitioners and administrators believe current legislation is sufficient (47 percent; n=45), than those who believe it to be insufficient (36 percent). One individual from Environment Canada argued:

> The legislation is fine and clearly allows for addressing health due to the wide definitions of environment and environmental effects. It is the practitioners who have not taken to incorporating it (Environment Canada per. Comm., 2004).

The remaining practitioners and administrators believe current legislation is 'somewhat' sufficient (4 percent) and 13 percent are unsure. The problem commonly reported with regard to EA legislation is that it is too vague and does not provide enough guidance on health integration. One interviewee from the National Energy Board contended:

> There is insufficient guidance and direction in the *Act* for proponents and responsible authorities to justify looking at human health impacts as part of the EA (National Energy Board per. Comm., 2004).

However, current EA legislation is deliberately broad in scope to enable practitioners to apply the process to all kinds of development projects in different locations across Canada. Clearly there is room for improvement, but perhaps it is the lack of agreement and understanding (knowledge) of the scope of health issues that is most significant. For example, while the *Act* is criticized by some, the MVRMA is praised as the social and economic impacts play a much stronger role in the EA. Perhaps an individual from Health Canada put it best by saying:

> This relatively new legislation (*Act*) starts to address the integration of human health into EA. However, a simultaneous cultural change is required of practitioners, legislators, administrators, etc. (Health Canada per. Comm., 2004).

Adopting a more contextually-relevant approach to legislation, such as the MVRMA, would arguably help to improve northern EA practice with regard to human health inclusion.

Other knowledge barriers identified by participants specific to the North included: cultural differences, lack of education/training, long-term complexity of impacts (i.e. cannot be predicted) and language barriers[34]. More specifically, Mulvihill and Baker (2001) contend that EA in the North face two key challenges. First, the formal EA process needs to be adapted to local culture and customs. Second, the EA and scoping processes (discussed earlier) must be receptive to diverse knowledge systems, including TK. Adapting the EA process to specific needs of the North in addition to overcoming each barrier identified in Trudgill's AKTESP framework is therefore necessary for EA practice to be successful in the North.

[34] For many of the northern residents, English is not their first language (e.g. Inuit, Cree, etc.), therefore, communicating results back to some communities is difficult. It is, therefore, important all documentation be produced in all relevant languages.

4.5 Summary

Northern EA practice faces many of the same challenges as in the rest of Canada; however, it is further complicated by the profound differences between southern and northern regions including Arctic environments, Aboriginal cultures, and socio-political systems (O'Neil and Solway, 1990). In light of the questionnaire and interview results, it is clear that the integration of human health in northern EA practice is less than sufficient. Human health is included on an *ad hoc* basis with little actual impact assessment of health effects. Case examples demonstrate that northern EA practice *can* go beyond assessing only the aspects of projects for which proponents have direct control over, to include community-based health assessment (for example, Ekati diamond mine). Steps need to be taken by EA practitioners and administrators in conjunction with Health professionals to improve EA practice in the North. Such directions are discussed in the following chapter.

CHAPTER 5
CONCLUSION

5.0 INTRODUCTION

This research resulted from the need to bridge the gap between EA and HIA in northern EA practice, identified by a number of EA and health researchers, including Davis and Sadler (1997) and Steinemann (2000), as a critical issue in need of research and development. The literature review illustrated that human health is not adequately considered in northern EA practice (O'Neil and Solway, 1990), and when health effects are considered they are generally limited to the investigation of effects on the non-human, natural environment (Davies and Sadler, 1997) and fail to address the impacts of project development on human communities and culture (Burdge, 2002; Joffe and Sutcliffe, 1997). A few studies have addressed this issue, specifically the amount of attention given to health impacts in EA impact predictions (Birley, 2002; Steinemann, 2000; BMA, 1998; Canter, 1996), however, they do not address health in terms of the real state-of-EA practice from screening to follow-up and monitoring.

This research employed a mixed methods approach to assess the state-of-EA practice with regard to human health integration in the Canadian North. The first objective of this research was to identify the provisions for health impact assessment under northern environmental systems. The second objective was to identify the 'health determinants' for consideration in project assessment as outlined by Health Canada, and to reassess its adequacy for use in the North. The third objective employed a questionnaire of EA practitioners and health professionals, experienced with EA across northern Canada, to evaluate the state-of-practice of health in EA. Participants included individuals from federal, provincial and territorial governments, industry representatives, consultants, proponents, health professionals and representation from Aboriginal and First Nations groups, all with experience with EA in the North. Emphasis was placed on the state of health assessment in

large scale resource development projects under both comprehensive study and panel review assessment frameworks. The results of the first three objectives informed the fourth objective, to determine if additional determinants need to be considered in northern EA practice. The following section reiterates the main research findings, highlights potential limitations and sets the stage for future research in EA and health integration.

5.1 Summary of Findings

5.1.1 Provisions for HIA under northern EA systems

Consideration of human health impacts in EA is guided by several pieces of Canadian federal, provincial and territorial legislation, including the current *Act* which defines an 'environmental effect' as including any change that a project may cause in the environment, including any effect of any such change on human health (CEAA, 2003a, c.37 s2(1)). The recent inception of the MVRMA, YESAA and the NLCA, in the three northern territories have made significant strides towards overcoming these challenges, due to their holistic approach to health and well-being. However, human health inclusion in northern EA practice, as reflected by study participants and based on recent comprehensive study and panel review assessments, remains inconsistent and poorly done. Burdge (2002), for example, suggests that the assessment of social impacts, including impacts on human health, remains the orphan of the EA process.

Debate continues among EA practitioners and administrators as to whether human health should be separated from EA, or more fully integrated in the assessment process; however more participants are in favour of an integrated approach. Health professionals suggest the advantages outweigh the disadvantages for three reasons: 1) it would be too expensive and time consuming to develop separate legislation for HIA, and industry would not support another piece of legislation nor would government officials who are struggling with current EA legislation; 2) a great deal of information needed by HIA exists within an EA. If HIA existed as a separate process there would be a duplication of effort; and 3) decision-makers need EA and HIA advice at the same time (integrated) in order to

make a decision. That said, a greater degree of integration would allow human health impacts to be addressed more effectively.

5.1.2 Existing Health Determinants

Despite the development of Health Canada's (1999) Handbook on HIA, which defines 'health' and includes a description of the determinants of health, an incomplete understanding of the scope of health in northern EA exists. Many EA practitioners and administrators see health as outside the project's scope and there is a perception among some that EAs for resource development projects are already too complicated and cannot include everything. This complaint may be well founded in that EAs cannot include unnecessary data (see for example the Rabbit Lake case previously discussed); however, one of the main purposes of conducting an EA is to "evaluate all relevant environmental and resulting social effects which would result from a project" (Battelle, 1978: 24), including those effects on human health. Each project may not warrant the same amount of detailed review of human health impacts, however all projects should consider health.

Health determinants such as 'sustaining Aboriginal cultural identity' and the 'link to the environment' are recognized in the literature as factors that should be incorporated when assessing the health effects of northern developments (O'Neil and Solway, 1990). Questionnaire and interview participants confirm these results and identified other health determinants as important to include for northern environments, most notably: cultural activities and diet (country food). This includes maintaining the integrity of such activities as 'hunting on the land' and obtaining traditional native foods, as well as psychological, social, cultural and spiritual values important in the North. Even though the nine determinants of health are based on the WHO's definition of health, such factors, important in the North, currently reside outside of the scope of the Health Determinants Framework.

5.1.3 Current State-of-EA Practice

Though improvements can be seen in the evolution of EA in Canada, there remains considerable variation between projects (Gibson, 2002). This is particularly true in the North, where sustaining human health pre and post large-scale

development projects challenges practitioners and the EA process. It is becoming increasingly clear to government officials and industry representatives that development can have adverse, as well as *beneficial* effects on health and well-being of those people potentially affected (Davies and Sadler, 1997). Many participants therefore agreed that not only should EA protect human health, but no development project should be allowed to proceed in the North unless it improves health. This recommendation is echoed in the literature, suggesting that all development projects should provide the opportunity for health promotion (ADB, 1992).

In practice, more attention is typically given to physical health and health impacts due to physical environmental change than to broader social health impacts during each stage of northern EA. Social, economic and other 'human environmental' effects are examined where relevant, but their inclusion is often an indirect one. In addition, human health impacts are being incorporated more often during the screening and scoping (pre-decision) stages than during follow-up and monitoring (post-decision) stages, therefore, leaving the actual health effects largely unknown and unaddressed. These findings are consistent with the literature which suggests that follow-up is missing or *ad hoc* in most EA practices (Arts *et al*., 2001; Austin, 2000; Morrison-Saunders and Bailey, 1999; Glasson *et al*., 1999), while the need for, or importance of, follow-up is well founded (Arts, 1998; Culhane *et al*., 1987; Sadler, 1987).

In addition to not fully understanding the scope of health, not all EA practitioners have the necessary expertise to adequately assess human health impacts due to project actions. EA practitioners and administrators seem to be divided based on world views: those who view the North as a *frontier*, or those who view it as a *homeland*. For example, 'federal authorities', 'provincial authorities' and 'consultants and proponents' seem to have adopted the 'frontier' theme, whereas 'territorial authorities' and 'others' have taken on the 'homeland' theme which coincides with areas dominated by Aboriginal peoples. Adopting a new definition of health based on the 'homeland' theme to include both social and environmental aspects in conjunction with increased support from Health Canada can strengthen the EA process. Currently, health professionals are playing insignificant roles in EA

practice and need to become more actively involved in all phases of EA in a timely and cost effective way (Davies and Sadler, 1997).

5.1.4 Advancing the Health Determinants Framework

An integrated approach to northern EA would be based on the recognition that health and social and environmental well-being are inextricably linked, and that health must include social, cultural and psychological effects in addition to environmental change (Kemm, 2000). Incorporating methods which are best suited to the environment in which the project is taking place in conjunction with contextually relevant health determinants will assist EA practitioners focus on the desired as well as the likely effects of project actions, including indirect and cumulative change, on those determinants. For example, Corvalán *et al*. (1999: 656-657) suggest:

> People experience the environment in which they live as a combination of physical, chemical, biological, social, cultural, and economic conditions that differ according to their local geography.

To be effective, northern EA practice must therefore be sensitive to the uniqueness of northern communities (FNIHB, 2001) and the understandings and beliefs of the people who live there.

A more inclusive framework for the determinants of health in the North would include: cultural activities (including traditional landuse); traditional knowledge; traditional health care practices; diet/country food; gender and social problems (i.e. alcohol /substance abuse, family violence, etc.). Figure 5.1 illustrates the proposed changes to the traditional Health Determinants Framework. This revised framework provides a template for northern EA practice to follow; however the determinants of health must still be adapted to meet the needs of the affected communities. For example, the North is home to a diverse group of Aboriginal peoples, including the Inuit, Métis, and the Dene and Yukon First Nations (INAC, 2003), each with their own traditional customs and beliefs. To that end, methods such as community health impact assessment (CHIA) could be used in the North to promote and enhance the health of northern residents. CHIA is a strategy used to

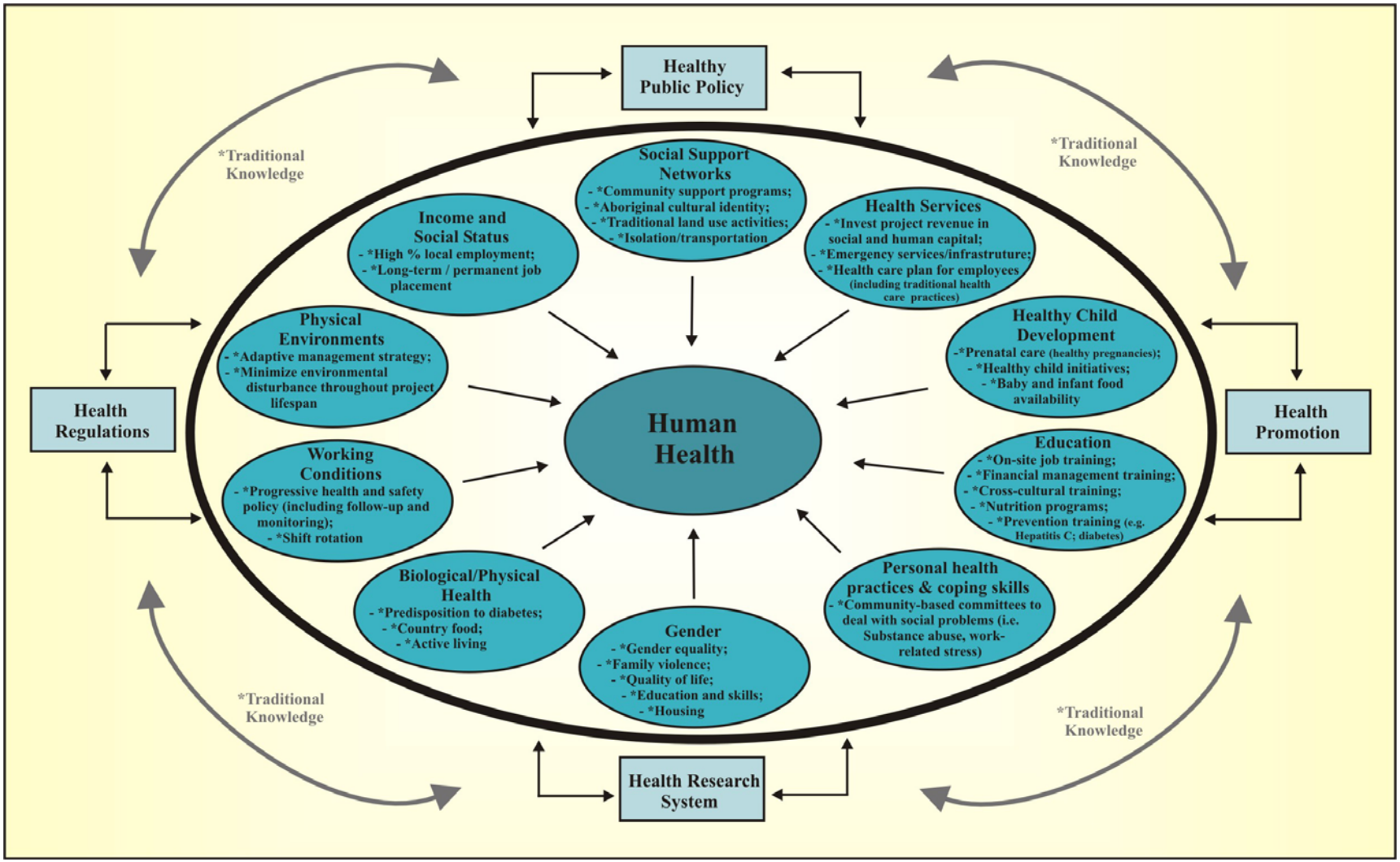

Figure 5.1. Model of the Determinants of Health appropriate for the North
Source: Kwiatkowski and Ooi (2003); questionnaire and interview respondents.

increase public understanding of the broad determinants of health and, through this educational process, empower citizens to have an active voice in decisions influencing their health. In addition, health determinants and community health impact assessment tools (CHIATs) can be identified by groups of participants in the affected communities in conjunction with regional health boards, suitable for their community (Gillis, 1999). EA practitioners and administrators in the North can use this information while conducting the assessment. Such an approach is grounded in the belief that the people in the community know what it takes to make their community healthy.

5.2 Improving EA Practice in the North

In addition to the proposed Health Determinants Framework (Figure 5.1), increased training for practitioners and administrators, through support from Health Canada and other health agencies, will contribute to environmental improvement. Adopting a similar relationship between Health Canada and EA practitioners to that of other departments may be advantageous. The Department of Fisheries and Oceans of Canada (DFO), for example, are the experts with regard to aquatic impacts due to projects and have very clear legislation available to practitioners to facilitate accurate assessment practices (Murphy, 2001). In the same way, Health Canada are the experts for understanding project impacts on human environments. However, to demonstrate this expertise, Health Canada needs to legislate specific steps for practitioners to follow when assessing human health impacts in project EA and needs to provide consultation and review support during the EA process.

The disparate results underscore the need to incorporate human health impacts into each stage of northern EA practice. This is particularly important as the health status of northern Canadians has progressed in waves, from the initial impact of infectious diseases (tuberculosis, for example) to a new epidemic of equally lethal lifestyle and environmental pathology (Sarsfield, 1988). It is only through a combination of actions by environmental and health professionals during each stage of EA can the minimization or elimination of adverse health effects and the incorporation of beneficial effects begin to improve the health status of northerners (O'Neil and Solway, 1990). To do this, northern EA practice must follow-up on

impact predictions and management measures to identify the real health effects of project development, ensure that specified objectives are being met and that management measures are sufficient. EA cannot achieve its sustainability objective without a systematic and comprehensive post-project analysis or follow-up program (Wlodarczyk, 2000). In respect to paragraph 20(1)(a) section 38(1) of the *Act*, the Minister of Environment proposes that "where a responsible authority takes a course of action…it shall consider whether a follow-up program for the project is appropriate…and, if so, shall design a follow-up program…and ensure its implementation". It is clear that current EA practice could be improved by a reallocation of follow-up efforts (Noble and Storey, 2005), thus improving human health in the North.

5.3 Research Contributions

This research contributes directly to the ongoing efforts to strengthen the role of EA as a tool to identify, evaluate and manage the potential implications of northern development on human health. This research provides documentation of EA practitioner's and administrator's experiences with health inclusion in northern EA practice; including lessons learned from recent case examples of comprehensive study and panel review EAs. Examining EA practitioner's, administrator's and health professional's experiences can help to identify and understand the barriers to effective integration. In this regard, this research provides a positive and practical contribution to northern EA practice.

In addition, the revised Health Determinants Framework is an important contribution to northern EA practice in that it provides EA practitioners and administrators the necessary characteristics and design principles of contextually relevant EA practice with regard to human health inclusion. This is of particular importance to health professionals who continuously promote the need to address health impacts in northern EA, and to EA practitioners who seek guidance on the appropriate health determinants that should be considered during EA practice. Not only can this framework help to protect human health in the face of northern development, but it expands the definition of health for use in EAs in the North and across Canada.

5.4 Study Limitations

Despite the research contributions, it is important to note there are two main limitations of this research. First, as highlighted in Chapter 1, there are four types of EA, namely screenings, comprehensive studies, review panels, and mitigation. This research focused on large-scale development projects taking place in the North (i.e. projects subject to comprehensive studies or panel reviews). The research results are therefore limited to a subset of EA practice in the North. However, it is these types of projects arguably, that individually have the most significant impacts on northern health as well as the most significant potential for northern health improvement. Second, the North is comprised of a diverse mix of landscapes and regional variation. The environmental, social, and economic realities in one area of the North may differ substantially from other parts of the North. For example, Nunavut differs from the other territories and provinces in that its aboriginal population is greater than 85 percent (Figure 2.2), predominantly Inuit, and experiences much less development pressures than the other territories. In addition, the majority of large-scale development projects, particularly those associated with pipeline development, are concentrated in the area under jurisdiction of the MVRMA and not equally distributed across the Canadian North. As a result, research results may not be equally applicable to all regions of the North.

5.5 Future Research

According to Mitchell (1989:3), the geographer seeks to "understand the fundamental characteristics of natural resources and the processes through which they are, could be, and should be allocated and utilized." Resource development in the North is likely to increase in the near future; it is therefore necessary that EA practitioners and administrators understand and incorporate human health in project-level assessment. Future research is needed to address the complexity of the relationships between environmental change and health in order to construct models that successfully quantify and predict, with a reasonable degree of accuracy, the impacts of a project on human health. Studies should thus focus first on increasing our understanding of the nature and extent of human health effects associated with project development, including indirect causality. In addition, studies are needed to

explore the characteristics of regional variation in the North, and the impact, if any, on EA practice and health integration.

Additionally, an evaluation of recent-practice health assessment activities in the North could prove useful in moving EA forward as a tool for achieving and promoting human health. For example, some research participants identified examples of 'good' and 'poor' practices with regard to integrating human health in EA in the North. For some of the projects however, it was noted by several participants that though aspects of the project provide examples of 'good' EA practice with regard to human health inclusion, there remains room for improvement. In other words, some cases are examples of both 'good' and 'poor' practice. Projects identified as examples of 'good' practice included the: Ekati Diamond Mine; Diavik Diamond Mine; Voisey's Bay Nickel Mine and Mill; Snap Lake Diamond Mine; and Beaufort Sea Expansion Drilling Program (currently under review). However, examples of 'poor' practice also included the: Ekati Diamond Mine; Diavik Diamond Mine; Voisey's Bay Nickel Mine and Mill; and Snap Lake Diamond Mine. Additional projects identified as 'poor' practice included the: Great Whale project and the Giant Mine.

The Mackenzie Gas Project, a large-scale development project currently taking place in the North, could also be an interesting case study with regard to human health inclusion. The proposed project involves a 1220 kilometer natural gas pipeline system that extends from Taglu in the NWT to Zama City in northern Alberta, traveling along the Mackenzie Valley of Canada's Northwest Territories. The project involves several Aboriginal and First Nations groups, including the Gwich'in and Sahtu First Nations, and crosses several jurisdictional boundaries. At the time of this research the EA for the project is underway and the Terms of Reference for the EA include determinants of health. It would be useful to see if the Terms of Reference are strictly followed and if the actual health effects are identified and mitigated. The Mackenzie Gas Project is timely in that it comes full circle from the 1970s Berger Pipeline Inquiry and thus provides an interesting opportunity, and perhaps benchmark, for an investigation of the quality of EA in terms of incorporating human health and human health impacts into project assessment in the North.

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APPENDIX A: Questionnaire Survey[35]

Definition of Terms:

Environmental assessment (EA) is defined by the Canadian Environmental Assessment Agency (CEAA, 2003a) as a planning process to anticipate and prevent the ecological and related implications of human activities.

Under the current Canadian Environmental Assessment Act, an **'environmental effect'** is defined as "any change that the project may cause in the environment, including any effect of any such change on health and…" (CEAA, 2003a, c.37s2(1)).

Health Impact Assessment (HIA), defined by the World Health Organization, is a process to identify, predict and evaluate the potential human health impacts of a proposed policy, plan, program or project.

Study Region. The term 'North' or northern Canada' is used in this research to refer to the area north of the southern limit of the discontinuous permafrost zone (Figure 1).

Human Health. In this research 'human health' is defined as a "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 1987). Please refer to this definition and the various 'health determinants' when answering survey questions (Figure 2).

[35] This version has been modified slightly from the original to comply with thesis standards.

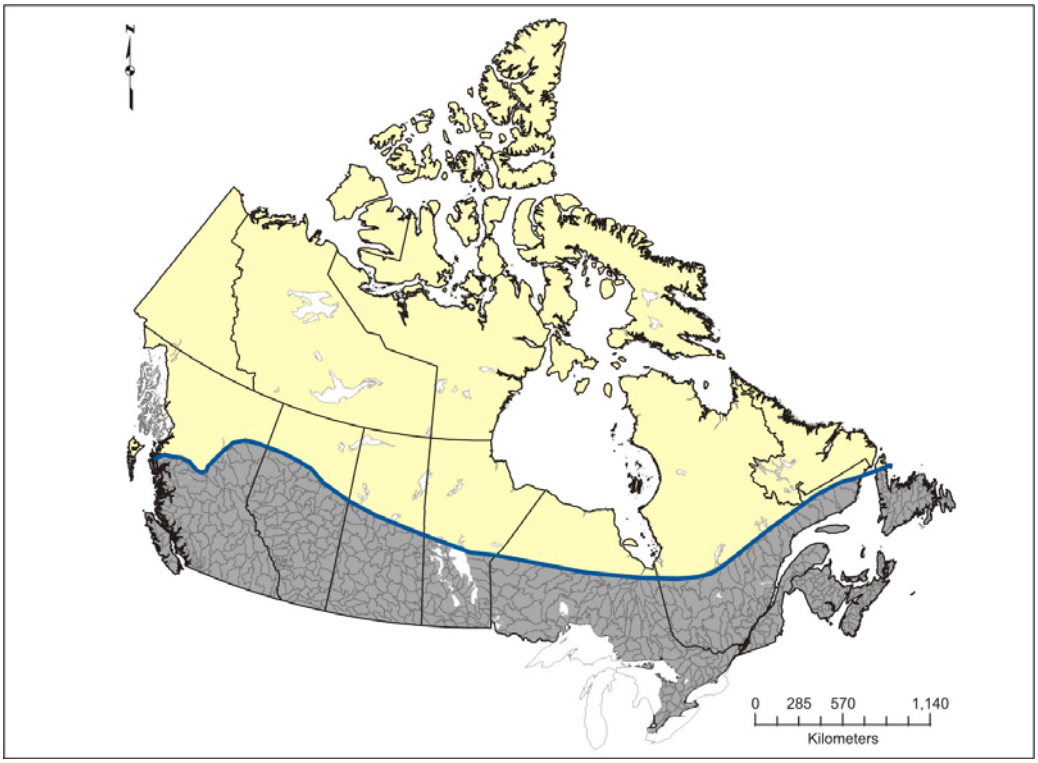

Figure 1. The Canadian North, Defined as the area north of the southern limit of the Discontinuous Permafrost Zone

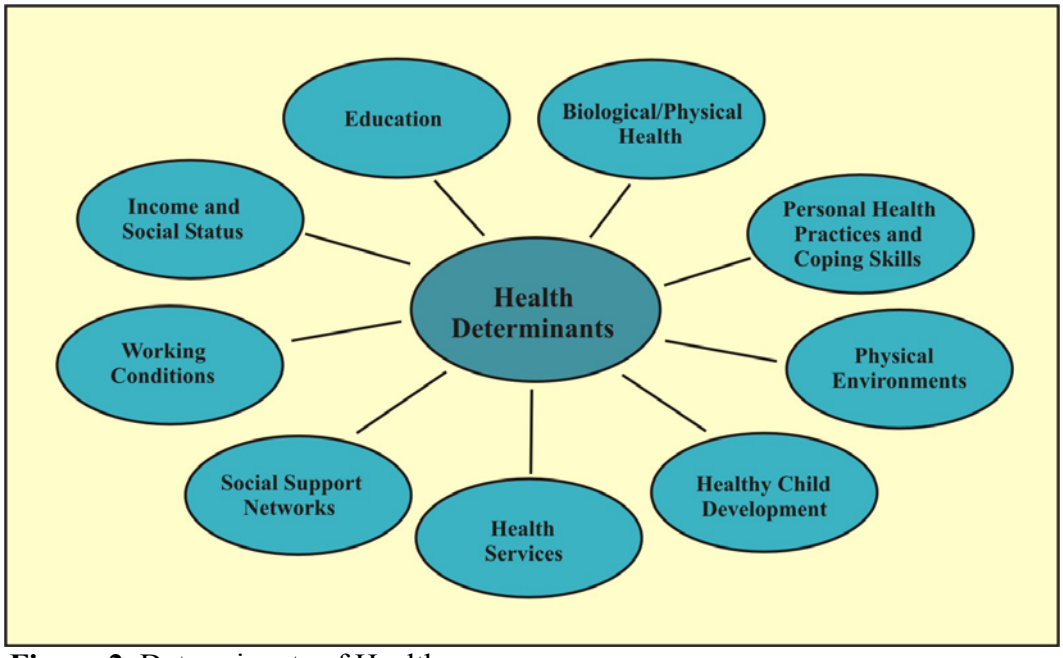

Figure 2. Determinants of Health
Source: Modified from Health Canada, 1999.

PART I: HUMAN HEALTH AND EA

1. How important is it to consider human health issues in the environmental assessment of development projects, including northern and non-northern regions? Check the appropriate box.

☐ not important	☐ slightly important	☐ somewhat important	☐ moderately important	☐ important	☐ strongly important	☐ extremely important

2. What percentage of the time would you say human health impacts are addressed in EA?

For northern developments _____% For southern developments_____%

3. How would you rate the performance of northern EA in terms of addressing the impacts of development on human health?

☐ Very poor: health issues are not addressed in EA practice

☐ Poor: health issues are given superficial and summary treatment, but impacts are not Assessed

☐ Below average: only specific physical health impacts are addressed (e.g. disease)

☐ Average: physical health impacts and health risks are assessed

☐ Above average: physical health impacts and risks are treated as important as other potential impacts

☐ Very good: health is broadly defined to include biophysical health as well as social health impacts

☐ Excellent: physical and social health impacts are thoroughly and completely addressed

4. In comparison to the EA of development projects in the 'south', how important is it to consider human health impacts for development projects in northern environments? Check the appropriate box.

				More important		
More important →	☐ slightly	☐ somewhat	☐ moderately	☐ more important	☐ strongly	☐ extremely
Equally important →	☐					
				Less important		
Less important →	☐ slightly	☐ somewhat	☐ moderately	☐ less important	☐ strongly	☐ extremely

5. When human health is considered in northern EAs, what percentage of the time would you say health impacts are:

a) Directly assessed: identified as key project impacts or valued system components: _____%

b) Indirectly assessed: subsumed under broader environmental or socioeconomic components: _____%

6. How *often* in northern EA practice is 'human health' or 'human health impacts' incorporated in each of the following components? Please check the appropriate box for each EA component.

EA Component	0% of all cases	1 – 19% of all cases	20 – 39% of all cases	40 – 59% of all cases	60 – 79% of all cases	80 – 99% of all cases	100% of all cases
project description							
baseline description							
identification of valued system components							
impact prediction							
determination of impact significance							
design of impact management measures							
post-project follow-up and monitoring							
impact benefit agreements							

7. How *important* in northern EA practice is it to consider 'human health' or 'human health impacts' in each of the following components? Please check the appropriate box for each EA component.

EA Component	not important	slightly important	somewhat important	moderately important	important	very important	extremely important
project description							
baseline description							
identification of valued system components							
impact prediction							
determination of impact significance							
design of impact management measures							
post-project follow-up and monitoring							
impact benefit agreements							

8. In comparison to physical environmental factors, how much *emphasis* is typically given to 'human health' or 'human health impacts' in each of the following northern EA components? Please check the appropriate box for each EA component.

EA Component	extremely less emphasis	less emphasis	slightly less emphasis	equal emphasis	slightly more emphasis	more emphasis	extremely more emphasis
project description							
baseline description							
identification of valued system components							
impact prediction							
determination of impact significance							
design of impact management measures							
post-project follow-up and monitoring							
impact benefit agreements							

9. In comparison to physical environmental factors how much emphasis *should* be given to 'human health' or 'human health impacts' in each of the following northern EA components? Please check the appropriate box for each EA component.

EA Component	extremely less emphasis	less emphasis	slightly less emphasis	equal emphasis	slightly more emphasis	more emphasis	extremely more emphasis
project description							
baseline description							
identification of valued system components							
impact prediction							
determination of impact significance							
design of impact management measures							
post-project follow-up and monitoring							
impact benefit agreements							

PART II: PREDICTING HEALTH IMPACTS

10. When human health is addressed in northern EA, which methods/techniques are typically used to identify, predict or assess health impacts? Please respond by:

a) indicating in the table any additional methods used that are not identified below;
b) indicating, by checking the appropriate box, how often each of these methods are used;
c) providing, in the last column, a *rating* of the usefulness of *each* method on a scale from: 1 (not at all useful); 3 (somewhat useful); 5 (useful); 7(extremely useful); 2, 4, 6 (intermediate ratings)

Methods	0% of the time	1 – 19% of the time	20 – 39% of the time	40 – 59% of the time	60 – 79% of the time	80 – 99% of the time	100% of the time	Rating
Professional Judgement								
Comparative case study analyses								
Interaction Matrices								
Simple Checklists								
Network Analyses								
Qualitative risk assessment								
Dialogues with communities								
Epidemiological modeling								
Other:								
Other:								

11. How important is it to consider 'Traditional Ecological Knowledge' in assessing human health impacts in northern EA?

☐	☐	☐	☐	☐	☐	☐
not important	slightly important	somewhat important	moderately important	important	strongly important	extremely important

12. What percentage of the time would you say 'Traditional Ecological Knowledge' is used in northern EA practice to identify and/or evaluate potential health impacts?

☐	☐	☐	☐	☐	☐	☐
0% of the time	1 – 19% of the time	20 – 39% of the time	40 – 59% of the time	60 – 79% of the time	80 – 99% of the time	100% of the time

PART III: HEALTH DETERMINANTS

13. Based on your knowledge and experience, what percentage of the time is each of the following determinants of human health addressed in northern EA?

Determinant	0% of all cases	1 – 19% of all cases	20 – 39% of all cases	40 – 59% of all cases	60 – 79% of all cases	80 – 99% of all cases	100% of all cases
Income and social status							
Education							
Physical Health							
Personal health practices and coping skills							
Social support networks							
Working conditions							
Physical environments							
Healthy child development							
Health services							
Other:							

14. In cases where these determinants are considered in northern EA, how often are they included in the description of the project or environmental setting?

Determinant	0% of all cases	1 – 19% of all cases	20 – 39% of all cases	40 – 59% of all cases	60 – 79% of all cases	80 – 99% of all cases	100% of all cases
Income and social status							
Education							
Physical Health							
Personal health practices and coping skills							
Social support networks							
Working conditions							
Physical environments							
Healthy child development							
Health services							
Other:							

15. When these determinants are considered in northern EA, how often are they used to determine the significance of project impacts?

Determinant	0% of all cases	1 – 19% of all cases	20 – 39% of all cases	40 – 59% of all cases	60 – 79% of all cases	80 – 99% of all cases	100% of all cases
Income and social status							
Education							
Physical Health							
Personal health practices and coping skills							
Social support networks							
Working conditions							
Physical environments							
Healthy child development							
Health services							
Other:							

16. When these determinants are considered in northern EA, how often are they followed-up and monitored during post-project assessment?

Determinant	0% of all cases	1 – 19% of all cases	20 – 39% of all cases	40 – 59% of all cases	60 – 79% of all cases	80 – 99% of all cases	100% of all cases
Income and social status							
Education							
Physical Health							
Personal health practices and coping skills							
Social support networks							
Working conditions							
Physical environments							
Healthy child development							
Health services							
Other:							

17. Overall, how would you rate the performance of recent northern EA practices with regard to incorporating each of the following determinants of human health? (Please refer to question # 3 for explanation of choices).

Determinant	Very Poor	Poor	Below Average	Average	Above Average	Very Good	Excellent
Income and social status							
Education							
Physical Health							
Personal health practices and coping skills							
Social support networks							
Working conditions							
Physical environments							
Healthy child development							
Health services							
Other:							

18. How important is it to consider each of the following determinants of human health in northern EA?

Determinant	Not Important	Slightly Important	Somewhat Important	Moderately Important	Important	Very Important	Extremely Important
Income and social status							
Education							
Physical Health							
Personal health practices and coping skills							
Social support networks							
Working conditions							
Physical environments							
Healthy child development							
Health services							
Other:							

19. In cases where these determinants are addressed in northern EA, how often are gender-based differences considered?

Determinant	0% of the time	1 – 19% of the time	20 – 39% of the time	40 – 59% of the time	60 – 79% of the time	80 – 99% of the time	100% of the time
Income and social status							
Education							
Physical Health							
Personal health practices and coping skills							
Social support networks							
Working conditions							
Physical environments							
Healthy child development							
Health services							
Other:							

20. How important is it to consider gender-based differences in northern EA for each of the following determinants?

Determinant	Not	Slightly	Somewhat	Moderately Important	Important	Very	Extremely Important
Income and social status							
Education							
Physical Health							
Personal health practices and coping skills							
Social support networks							
Working conditions							
Physical environments							
Healthy child development							
Health services							
Other:							

21. Are there other determinants of human health that are typically (i.e. > 60% of the time) addressed in northern EA practice that are not included in the table below?

Determinant
Income and social status
Education
Physical Health
Personal health practices and coping skills
Social support networks
Working conditions
Physical environments
Healthy child development
Health services

Other determinants typically addressed:

22. Are there other determinants of human health that *should* be considered when addressing human health impacts in northern EA?

Other determinants that *should* be considered:

PART IV: PERSONAL EXPERIENCE

23. Overall, what would you identify, if any, as the main barriers to the effective integration of human health in northern EA practice? Please indicate by:

a) adding any additional barriers to the list that you consider important; and

b) providing, in the last column, a *rating* of the significance of each barrier from: 1 (not significant); 3 (somewhat significant); 5 (significant); 7(extremely significant); 2, 4, 6 (intermediate ratings)

BARRIERS	RATING
Incomplete understanding of the scope of health in EA	
Absence of standardized procedures of assessing human health impacts in EA	
Lack of communication and coordination between EA practitioners and health professionals	
Difficulty obtaining health data	
Legislation too restrictive or insufficient	
Economic barriers (i.e. lack of funding)	
Temporal barriers (i.e. lack of time)	
Other:	
Other:	
Other:	

24. How many EAs have you been involved with in the past 20 years? _____

In what capacity? Please check all that apply.

- ☐ Proponent
- ☐ Federal or provincial authority
- ☐ Review panel
- ☐ Consultant
- ☐ Special interest group organization or representative
- ☐ Non-direct academic, personal or professional interest
- ☐ Other _____

25. How many EAs have you been involved with in the past 20 years in Canada's northern regions? _____

In what capacity? Please check all that apply.

- ☐ Proponent
- ☐ Federal or provincial authority
- ☐ Review panel
- ☐ Consultant
- ☐ Special interest group organization or representative
- ☐ Non-direct academic, personal or professional interest
- ☐ Other _____

26. In your opinion, should human health impact assessment be part of EA practice?

Please elaborate:

27. In your opinion, is current legislation under CEAA sufficient with regard to provisions and requirements for addressing human health in EA?

Please elaborate:

28. Please identify your background or area of expertise.

PART V: CASE STUDIES

29. Part of this research involves the investigation of 'good' and 'poor' practices with regard to integrating human health in EA in northern environments. Would you please briefly describe one case study example each of 'good' and 'poor' practice?

'Good' practice example:

'Poor' practice example:

Thank you for participating.
I will send you a summary of the survey results once available.
If you have any questions, please refer to my contact information provided.

APPENDIX B: Interview Questions

1. Should human health issues be considered as part of the environmental assessment of development projects (including both northern and non-northern regions)?

2. What, if any, would you say are the important differences between northern and non-northern regions with regard to the incorporation of human health issues in environmental assessment practices? (In other words, are there special circumstances of northern regions that make it especially important to consider health issues in the assessment of development projects?)

3. In your opinion, are there certain health issues that *should be* considered in EA specific to the North? If so, please specify and explain.

4. In your opinion, how *well* are human health issues being incorporated into EA practices in the North? Please elaborate.

5. Part of this research involves the investigation of 'good' and 'poor' practices with regard to integrating human health in EA in northern environments.

i) Could you provide an example of one case study of 'good' practice northern EA in terms of assessing health issues and impacts? What specifically makes it an example of 'good' practice?

ii) Could you provide an example of one case study of 'poor' practice northern EA in terms of assessing health issues and impacts? What specifically makes it an example of 'poor' practice?

6. Overall, what would you identify, if any, as the main barriers to the effective integration of human health issues in northern EA practice?

Appendix C: Ethics Approval

UNIVERSITY OF SASKATCHEWAN
BEHAVIOURAL RESEARCH ETHICS BOARD
http://www.usask.ca/research/ethics.shtml

NAME: Bram Noble (Jackie Bronson) Beh 04-11
Department of Geography

DATE: February 17, 2004

The University of Saskatchewan Behavioural Research Ethics Board has reviewed the Application for Ethics Approval for your study "A State-of-Practice Survey of Health and EA in the Canadian North" (Beh 04-11).

1. Your study has been APPROVED.
2. Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Committee consideration in advance of its implementation.
3. The term of this approval is for 5 years.
4. This approval is valid for one year. A status report form must be submitted annually to the Chair of the Committee in order to extend approval. This certificate will automatically be invalidated if a status report form is not received within one month of the anniversary date. Please refer to the website for further instructions http://www.usask.ca/research/behavrsc.shtml

I wish you a successful and informative study.

Dr. David Hay, Acting Chair
University of Saskatchewan
Behavioural Research Ethics Board

DH/ck

Office of Research Services, University of Saskatchewan
Room 1607, 110 Gymnasium Place, Box 5000 RPO University, Saskatoon SK S7N 4J8 CANADA
Telephone: (306) 966-8576 Facsimile: (306) 966-8597
http://www.usask.ca/research

Appendix D: Aurora Research Institute (ARI) Scientific Research Licence

SCIENTIFIC RESEARCH LICENCE

Licence # 13686N

File # 12 410 626

ISSUED BY: **Aurora Research Institute - Aurora College**
Inuvik, Northwest Territories

ISSUED TO: Ms Jackie Bronson
210 Brock Crescent
Saskatoon, SK S7H 4N4
Tel: (306) 477-0048

ON: 16-Jul-04

TEAM MEMBERS: Bram Noble

AFFILIATION: University of Saskatchewan

FUNDING: SSHRC

TITLE: A State of Practice Survey of Health and Environmental Assessment (EA) in the Canadian North

OBJECTIVES OF RESEARCH:
The purpose of this research is to evaluate the scope of health within Environmental Assessment (EA), and to assess the state of EA practice with regard to the incorporation of human health impacts within Canada's northern natural resource sector. This research will examine Health Canada's framework on the Determinants of Health and apply this theory to the incorporation of health with EA in northern development. Examining the scope and sufficiency of this framework combined with identifying practitioner experience will increase the understanding of human health effects and EA within this unique environment. The research contributions are twofold, to: 1) provide a better understanding of the scope of health; and 2) increase the understanding of the state of practice within the North. Upon completion, a framework identifying specific health determinants appropriate for the North will be presented for incorporation into EAs. In addition, this research will provide documentation of practitioners experiences from selected case studies, including lessons learned from recent practices, and will identify future research requirements.

DATA COLLECTION IN THE NWT:
DATE(S): July and August, 2004
LOCATION: Yellowknife

Licence# 13686 expires on December 31, 2004.
Issued at the Town of Inuvik on Friday, July 16, 2004

Andrew Applejohn
Director, Aurora Research Institute